

1 1921

PUBLIC WORKS

CITY

COUNTY

STATE



LONG SPAN CONCRETE ARCH ERECTED ON COMBINATION TRESTLE BENT AND HOWE TRUSS FALSEWORK SUPPORTING SEGMENTAL CENTERING RIBS CARRIED ON PONY BENTS. CONNECTED WITH HOISTING TOWER AND ELEVATED SERVICE TRACK

JUNE 25, 1921

P U B L I C W O R K S



A 30% saving on this excavating work

In comparing the cost of excavating by different methods, The Trumbull Public Service Corp. of Warren, Ohio, found that their Brownhoist saved them \$1,584 on one job alone. "Excavating for our power plant cost us \$1.10 per yard with a steam shovel," writes this company. "Under very similar conditions, excavating for our new plant, with a Brownhoist, cost us only 77 cents per yard, a saving of 33 cents."

Besides this saving, this company has found that it is much more economical to load the trucks on the surface instead of having to go down into the excavation. This they can do with a Brownhoist, but could not do by the old method.

The flexibility of a Brownhoist makes it adaptable to many other jobs in construction work. Catalog K shows different sizes and types of Brownhoists and the work they are doing in a variety of industries. May we send you a copy?

The Brown Hoisting Machinery Co., Cleveland, Ohio, U. S. A.

Branch Offices, New York, Pittsburgh, Chicago, San Francisco and New Orleans

BROWNHOIST
DEDICATED TO QUALITY SINCE 1880

PUBLIC WORKS.

CITY

COUNTY

STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"
Published Weekly by Municipal Journal and Engineer, Inc.

Publication Office, Floral Park, N. Y. Advertising and Editorial Offices at 243 W. 39th St., New York, N. Y.
Entered as Second-Class matter at the Post Office at Floral Park, N. Y., August 27, 1920, under the Act of March 3, 1879.

Vol. 50

JUNE 25, 1921

No. 26

Concrete Bridge Construction*

Standard and special methods, operations and plants for building substructure and superstructure of slab, girder, and arch spans, for highway and railroad traffic. The storing and handling of aggregate and cement; mixing, conveying, and placing concrete; construction of forms and falsework; striking arch centers; finishing concrete surfaces; making, transporting, and assembling pre-cast members; erecting, shifting and adjusting steel truss centers

Up to a maximum of about 30 feet for railroad service, and 40 or 50 feet for highway service, concrete bridges may be made with flat slabs or reinforced concrete girders, but above those spans they must either be hinged or hingeless arches, and may have full barrel vaults or multiple ribs. All arch spans either have solid longitudinal, spandril walls retaining a solid fill over the haunches up to the level of the crown or else they have a solid reinforced concrete floor slab supported on concrete girders carried by spandril posts, or by spandril arches.

The construction of concrete arch spans is divisible into five different operations, that of the substructure, the arch, or ribs, the spandril work, the floor and parapet or handrail. The necessity for very satisfactory and reliable foundations is so great that arches are not generally selected in cases where it is foreseen that great difficulties will be encountered in the foundations.

SUBSTRUCTURE

Ordinarily the foundations should be carried to rock or very satisfactory hard stratum; should not be exposed to scour, disturbance by adjacent subsequent operations, and the footing should be proportioned for moderate loads on prepared surfaces that should be inspected and concreted in the dry. They are made with the usual methods for mass concrete in open dry land pits, but where they are made in quicksand in very wet soil or in the river bed they generally require to be built in cofferdams or, under extreme conditions, by pneumatic caisson method. They sometimes have pile footings, but these are undesirable if they can be avoided.

Generally these piers are built with mass concrete without reinforcement, but sometimes the abutments and the wing walls connected with

them are reinforced or have reinforced extended footings. Usually the piers and abutments are built up several feet above the spring line and the ends of the arch spans are made integral with the substructure mass so that the curved portions overhang the vertical or battered faces of the piers, forming "umbrella" tops in which reinforcement bars are generally imbedded to bond with the arch ribs, so the construction joint thus becomes a sort of false skewback, the real skewback joint being provided at the theoretical intersection of the arch with the pier.

The construction of the cofferdams, unwatering them and bracing them are important features that are considered in another lecture.

CONCRETE MIXING AND HANDLING

Concrete for the piers and their footings should conform to standard requirements for ordinary mass concrete. The storing, mixing, conveying and distributing plants should generally be so designed and arranged as to be equally convenient and efficient for handling the concrete of the superstructure, including all of the five subdivisions of the bridge. A sufficient storage for aggregate and cement should be provided to last for several days and cover any possible interruption of delivery and as much as possible the aggregate should be handled by gravity alone from the time it is unloaded to the time it emerges from the mixer.

This can sometimes be accomplished by delivery of materials at road level or above, or by the installation of equipment on a side hill which may locate the concrete mixer below the level if requiring hoisting, which may thus be all concentrated at one point. Sometimes the materials can be unloaded from dump cars, but often it is necessary to provide clam-shell buckets or equivalent means of unloading them and sometimes conveying systems to distribute to the bins. For large jobs the concrete can be more advantageously mixed in two or more small mixers than in one

*Abstract of lecture illustrated by 50 stereopticon slides of methods, equipment and details delivered to the Junior and Senior classes in Civil Engineering at Cornell University, May 23, by Frank W. Skinner, consulting engineer, associate editor, PUBLIC WORKS.

very large one, an economy being thus effected and opportunity being provided for repairs and reduced service.

The mixer discharges directly into buckets, dump cars or loading hoppers serving the former. Under specially favorable circumstances the concrete may be spouted from the loading hopper directly to position for parts of the substructure, but generally it will have to be delivered to buckets handled by derricks or cableways or on flat cars on service tracks paralleling the bridge axis, or may be delivered directly to dump cars on the same tracks, which can discharge directly through chutes into the pier forms or in some circumstances into the forms for the superstructure.

If buckets are used they must be handled by derricks or cableways or by a locomotive crane also traveling on the service track. For one or two short spans under favorable conditions the entire work may consist of excavating for foundations, building forms, receiving, storing, mixing aggregate and putting it in place, and it may be handled by one or two stationary derricks, which, under some circumstances, are probably a more advantageous kind of plant.

CONCRETING IN LONGITUDINAL HALVES

Sometimes a long existing bridge is replaced by a series of concrete arch spans adjacent to and parallel with it, or occupying the same site, in which case it is frequently customary to build the new bridge of ample width and to construct it in successive longitudinal halves, the first one being built adjacent to the old one while the latter is in service, after which the traffic is transferred to the half of the new structure, the old structure removed and the new structure completed in its place. This system also provides for the whole or partial use of the old span for the building of the first half of the new span and the latter for building the second half. Frequently if the traffic is heavy it is impossible to install or operate complete facilities for material handling equipment entirely outside the limit of the new bridge and some of the construction plant is located on or over the bridge itself.

SLAB AND GIRDER SPANS

When short span superstructures consist simply of floor slabs or are a combination of concrete slabs and reinforced concrete girders, they may be built integral with the substructure and concreted in forms built at the site or, as is frequently the case, especially in railroad work and in the elimination of grade crossings where there are a large number of duplicate spans to be built, the floor slabs or the slabs and girders are pre-cast in the contractor's remote yard, and erected on the finished substructure.

Where there are a large number of short spans in one location, as in long viaducts, and in cases where there is very little clearance for heavy traffic that must be maintained, as in new city and town bridges provided for the elimination of grade crossings, economy or rapidity or safety is sometimes promoted by making the structure wholly or partly of pre-cast units which generally include the floor platform and sometimes the sub-

structure. In the latter case piers are replaced by vertical or inclined posts or transverse bents made monolithic or in separate pieces joined with field connections, usually some type of mortise and tenon or doweled joint, and generally grouted. They are also usually provided with knee braces, cast integral with the vertical members.

Pre-cast bridge members are almost always concreted in simple forms on a horizontal plane, which are often arranged so that the forms can be stripped from the sides and used over and over again while the members themselves remain to season undisturbed on their own original supports until they are strong enough to be handled. Such members and especially floor slabs and straight beams and girders are likely to be built in two or more tiers, separated by heavy building paper or its equivalent, thus eliminating bottom pieces to the successive forms, and requiring only vertical extensions on their sides to receive new sets of members.

As it is impossible to handle the members without producing temporary stresses different from those in the structure in service great care is taken to provide complete rules and regulations for handling them, and usually attachments are provided to insure the hoisting tackle's being attached at the proper points and if necessary special reinforcement bars are put in to provide against temporary bending stresses that might produce tensions in members otherwise exposed only to compression.

The weight and dimensions of the cast iron members vary greatly from light struts or transverse bents perhaps only 10 or 15 feet long to girders or thick slabs that may weigh up to 60 tons or even more.

The most numerous kinds of pre-cast units are plain, flat, floor slabs that may be of uniform thickness of 10 to 20 inches and lengths of 10 to 30 feet. They are generally made in several longitudinal sections, together forming the full width of the floor with special sections under the rails and to form the parapets and curbs enclosing the track ballast. Such members are very simple and easily cast, weigh from 10 to 60 tons, and are generally handled on flat cars from which they are unloaded at the casting yards and at the site by some type of derrick car, gallows frame, gantry, or their equivalent. They may, however, be handled by one or more derrick booms or travelers similar to those used for steel bridge erection, sometimes with an overhang reaching in advance, which are convenient for building transverse bents of the substructure.

As the different members of the substructure and superstructure only require to be held in position until the joints are made and grouted, the erection may be very rapid and the structure quickly completed and opened to traffic, thus causing a minimum of obstruction or delay and avoiding the difficulties of form work, obstruction and long waiting for concrete cast in place.

CONCRETING AND ERECTING PRE-CAST FLOOR SLAB SPANS

In recent work of the Chicago & Northwestern Railroad Company, the substructures for short spans at street crossings have been concreted in

JUNE, 25, 1921

P U B L I C W O R K S

543

place and the superstructures have consisted of thick reinforced floor slabs pre-cast at the central material yard in Chicago and transported, sometimes a considerable distance, to the bridge site.

At the yard there are eight 8 x 30-foot adjustable concrete casting decks on timber platforms that can be leveled to compensate for settlement under the heavy loads. A single slab was cast on each deck, and after it was two weeks old was lifted by a derrick and set aside to cure six weeks longer before transporting to the bridge site. The slabs were generally handled by 150-ton wrecking cranes, which loaded and unloaded them to and from the standard flat cars on which they were transported.

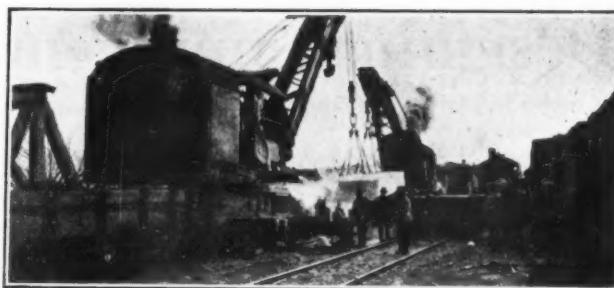
The two-track American Avenue bridge, at Carrollville, Wis., has a 24-foot span, made with slabs 28 feet long that weigh 36 tons each. The pair of slabs for the first track were brought in on a service trestle alongside, and after they were set in position the track was shifted to them, the trestle removed, and the other slabs brought in on the new track and placed alongside, completing the bridge.

The slabs for the 28-foot three-track span at Litts avenue, Chicago, were 35 feet long, weighed from 53 to 60 tons each, and were handled by two 150-ton wrecking cranes, because the booms of the latter were not long enough for a single machine to do the work. The advantage of using pre-cast slabs was shown by the fact that only 40 minutes were required to place the six slabs required for the structure, remove the falsework and restore the railroad track on the bridge, ready for traffic.

ARCH BARRELS AND RIBS

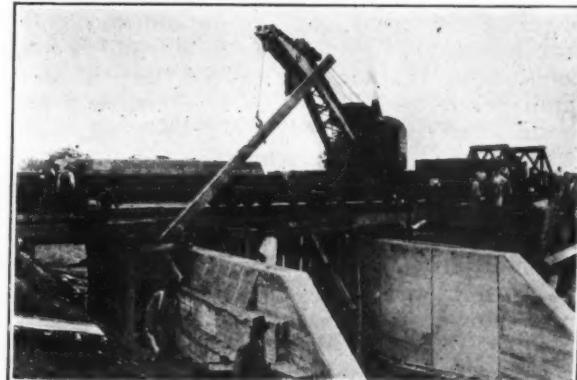
Arch spans are almost invariably cast in place in simple forms in which the bottom part is virtually composed of the transverse horizontal lagging conforming to the curve of the finished intrados. The lagging is generally supported on multiple ribs in longitudinal planes. For short spans, concreted on wooden falsework, the ribs, or at least their upper parts, are formed generally by scarf boards consisting of two or three thicknesses of planks with their outer edges cut to the required curve and their lower edges straight forming chords of the arc. The members may be supported directly on beams, columns or struts or they may form the top chords of the trusses, usually of full spans with their bottom chords supported at the spring line at the ends and perhaps at intermediate points also on pile or trestle bents or on crib work. Such supports are used chiefly for moderate length spans and occasionally for longer spans where there is only one to be erected at the site.

When there is no objection to obstructing the ground, ordinary falsework is likely to be convenient and economical, but if the span is very high, or navigation must be maintained under it or if the bottom is bad, or the water very swift, the centering is generally supported on the permanent substructure itself, or on special falsework at the ends of the spans or sometimes on bents, or cribs, at points subdividing it. In any event, the direct support for the arch, which is called the centering,



ERECTING 60-TON FLOOR SLABS WITH 150-TON WRECKING CRANES AT LIPPS ST., CHICAGO

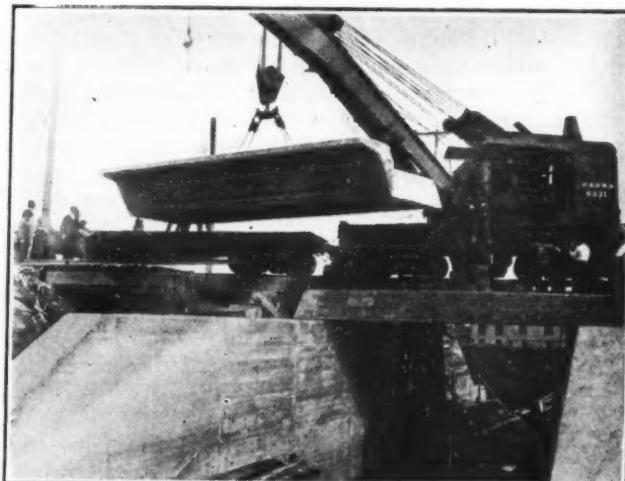
must always be made entirely separate from the falsework or equivalent substructure so that it may be easily lowered to clear it from the arch after the latter has become strong enough to be self-supporting. This operation is called "striking the center," and is usually accomplished by means of wedges, sand boxes, or sometimes jacks or



REMOVING FALSEWORK PREPARATORY TO ERECTING 36-TON PRECAST FLOOR SLABS ON SUB-STRUCTURE OF CARROLLVILLE BRIDGE

special methods. In the great Walnut Lane span, Fairmont Park, the heavy, high falsework timber was kept saturated with water during the concreting of the arch ring and when that was completed was allowed to dry out while the concrete was curing, thus gradually shrinking away and automatically striking the center.

(To Be Continued)



ERECTING 36-TON FLOOR SLAB 24 FEET LONG

Designing Improvements in Toledo Sewers*

Calculating volume of storm water. Storm water regulators for connection with intercepting sewers. The sewage pumping plant, screens and outfall sewer.

Storm Water Allowances.—A study of the rainfall records at Toledo showed that rain falls approximately 600 hours during the year, but that for only 200 hours of this time does the rate of precipitation exceed .02 inch per hour. Because of the large flow in the Maumee river and its consequent large diluting factor, no provision has been made in the intercepting sewers for storm water run-off from combined districts with outfalls discharging into that stream. In the case of combined sewers discharging into the two creeks, provision has been made in the intercepting sewers for carrying, in addition to the future maximum dry-weather flow, run-off from precipitations that do not exceed .02 inches of rainfall per hour. This, it is believed, will permit the intercepting sewers to receive all of the first flow of the sewer which is polluted with sewage solids which had previously been deposited in the sewer inverts. In providing for this amount of storm water run-off it is assumed that the run-off from residential areas is 30 per cent of the rainfall and from densely built up areas is 70 per cent. It is proposed, as previously stated, that future sewerage shall be on the separate system and that only 30 per cent of the total drainage area will be served by sewers on the combined plan, and therefore provision for this run-off was made for only this percentage of the total area.

STORM WATER REGULATORS

Plans were prepared for storm water regulators or regulating devices to divert from the intercepting sewers all storm flow in excess of the estimated dry-weather flow plus the storm water run-off due to a precipitation of .02 inch per hour on the drainage areas served by combined sewers.

Adjustment may be made so that when storms take place at times other than those of maximum dry-weather flow during the earlier years of operation, it will not be necessary to take more than the estimated dry-weather flow plus the storm water allowance. Under the most extreme conditions, the storm sewage will carry dry-weather sewage pollution into the river not more than 600 hours a year and into the creeks not more than 200 hours. The regulating devices were designed so as to control the flow into the intercepting sewer not only in time of storm but also should the outlets of the existing combined sewers be partly or wholly submerged due to backwater from the streams at times of freshets, ice gorges and the like.

Two types of mechanical regulating devices were designed, a flap gate type for small flows and a revolving or swing type for large flows. The

regulating chambers consist of three distinct compartments—a weir compartment, a gate compartment and a float compartment. The first replaces the existing sewer and contains a diverting weir, the crest of which is at the elevations to which the future maximum flow to be diverted will rise. The gate compartment contains the mechanical equipment and is connected with the weir compartment through a cast iron orifice. The float compartment contains the float for operating the gate and is connected with the weir compartment by means of a 4-inch cast iron pipe.

The flap gate type is a modification of the Gibbey foundry type. The revolving or swinging type gate has a face formed to an arc of a circle and revolves about a shaft which extends through the wall between the gate and float compartment. Under normal conditions the weight of the float holds the gate open and the weir diverts the flow from the combined sewer through the orifice and channel in the gate compartment to the intercepting sewer. If the level of the sewage rises because of storm water or of backwater from the stream, the float rises and causes the gate to cover a part of the orifice. The orifice is rectangular in shape and so placed that if the head increases 0.1 of a foot the area of opening is decreased so much that even with the increased head the quantity passing through is less than when the gate was completely open and the level of the sewage was at the weir crest. If the sewage continues to rise, the gate completely closes the opening and no discharge to the intercepting sewer takes place. Adjustment of the gate opening can be made as well as of the point where it will start to close.

SEWAGE PUMPING PLANT

The intercepting sewers on the west side of the river converge at a point a few feet west of the river at a point opposite an island, which is separated from the main land by a channel about 70 feet wide at this point. From the point of convergence a connecting sewer 90 inches in diameter and about 230 feet long extends under the channel to a pumping station on the island.

Here the sewage passes through openings provided with stop planks and thence through cage screens to suction wells. Five pumps, with provision for a sixth at a later date, are to be installed which will lift the sewage through a distance ordinarily of about 17 feet, which may be increased or decreased according to the level of water in the lake, with 2 to 12 additional friction head. The pumps force the sewage through a rectangular discharge sewer 6 feet by 7½ feet, which rises to and is placed just under the finished surface of the ground, its invert being about 2 feet below mean lake level. This discharge

*Continued from page 522

sewer, about 350 feet long, terminates in a skimming tank, where provision is made for skimming the matters floating in the sewage into a peripheral gutter. From the bottom of the skimming tank an outfall sewer is to be built consisting of a 60-inch reinforced concrete pipe extending about 575 feet from the skimming tank, where it ends in two branches extending at right angles up and down the river and just inside the boat channel line, through which branches the sewage will be discharged both at the ends and through eight nozzles.

Any excess flow of sewage which cannot be discharged through the 60-inch outfall above described will pass over a weir at the top of the skimming tank and flow through another 60-inch pipe which is continued for a short distance from shore, where it discharges through a single outlet. At some future time, if necessary, this pipe line may be extended to deep water and provided with multiple outlets.

Either or both of the two 60-inch outfall lines may be extended, if required, to future disposal works on the other side of the river. In such case the branches leading to the multiple outlets will be blocked off.

Just outside the pumping station the discharge sewer is provided with a spur to permit connection to chambers for fine screens, should fine screening or other treatment be found necessary in the future.

At the site of the pumping station four borings were made to a depth of about 32 feet below mean lake level. One on the main land disclosed about 12 feet of yellow clay top soil, underlain with blue clay. The three on the island passed through from 4 to 8 feet of muck and about half this depth of gravel, under which was hard blue or red clay. All of the foundations and structures rest on this hard clay except the discharge sewer, which will rest upon piles.

In order to afford access from the main land to the island, a concrete arch bridge is to be built spanning the channel at its narrowest point, where the width is about 60 feet.

The pumping station is 116 feet by 39 feet, with a screen wing at the center of the west side and a transformer wing at the center of the east. The superstructure is to be of brick masonry with stone trimmings and a tar and gravel roof. The sub-structure of the pumping station will extend to a depth of from 20 to 40 feet. The superstructure will be about 31 feet high and that of the wings about 23 feet high. The skimming tank will be about 20 by 30 feet, with a substructure 25 feet deep and a superstructure 20 feet high.

Just outside the screen room wall is a stop plank chamber. Three openings connect this with the screen chamber, controlled by three 4 feet by 5 feet sluice gates, which are operated by hydraulic cylinders. In the screen chamber are three diverging channels, in each of which are provisions for two cage screens, one behind the other, in order that one may be in use while the other is being cleaned. Each of these screen channels leads to the suction to two of the six pumps.

Each screen consists of a cage or box consisting of a frame built up of structural steel shapes, in which the screen bars are set. These bars are of half-inch galvanized iron pipe set around the front and two ends of the box. In the front they are in a double row, the pipes being staggered and spaced $2\frac{1}{4}$ inches apart between centers in each row, the two rows being 2 inches apart between centers. In each end there is a single row of bars spaced $1\frac{1}{8}$ inches to $2\frac{1}{4}$ inches centers. The screen is 8 feet wide on the face, the ends are 28 inches deep, and the screen is 9 feet high. The screen is guided by T bar guides fastened to steel channels which are built in the concrete wall. The screens are elevated by hoists, each hoist consisting of a drum and motor, each screen being counter-weighted. Ordinarily the lift of the screen will be about 35 feet and the hoist is to be able to lift the screen this distance in a minute and a half.

Just beyond each pair of screens is a suction wall containing the lower ends of the suction pipes of two pumps. The pumps rest on a floor $15\frac{1}{2}$ feet above the bottom of the bell-shaped opening of the suction pipe. Each pump discharges through a venturi meter, from which the sewage enters discharge channels of concrete which gradually converge from 6 to 3, these 3 combining into one just outside the building, where the discharge sewer begins.

The pumping plant consists of six pumps, five of which are to be installed at present. One of these has a capacity of 24 million gallons per 24 hours, and each of the other four has a capacity of 36 million gallons, at normal speed and with a 28-foot total lift, of which 15 feet is suction and 13 feet discharge. Each of these pumps has 36-inch suction and discharge pipes and contains a 36-inch by 24-inch venturi meter. Three of the pumps are constant speed and two of them, including the one of less capacity, have variable speed. The motors for the four large pumps are each to be of 300 horsepower and the fifth to be of 200 horsepower. All are of open slip-ring wound rotor type with current at 2,200 volts, 3 phase, 25 cycles. Between each pump and the venturi meter is installed a 36-inch gate valve to be operated by electricity, of the inside-screw, double-seat type and able to withstand a pressure of 50 pounds per square inch.

Each venturi meter will be provided with a device to indicate rate of flow and record both rate of flow and total amount passed.

The pump room floor is about 12 feet below mean lake level and precautions are taken to make the substructure of the pumping station waterproof. The concrete walls are 3 feet 9 inches at this depth and 24 inches at the top, which is about 8 feet above mean lake level. The outside of the outer walls are to be covered with two swabbings of a tough, rubbery, asphaltic bitumen having a melting point between 165 degrees and 180 degrees Fahrenheit.

THE DISCHARGE SEWER

Outside of the building, where the three discharge channels terminate at the beginning of the

discharge sewer, provision is made for placing stop planks in either of these three channels.

The discharge sewer rests upon piles placed in bents 6 feet apart between centers, each bent consisting of 3 piles capped with a reinforced concrete beam 12 inches deep.

The sewer enters the skimming tank with its invert 7 feet above the bottom of the vertical side walls of the tank. The bottom of the tank is hopper-shaped, sloping about 3 feet 10 inches lower than the bottom of the vertical wall, from which depth the 60-inch outlet pipe leads off. Surrounding the interior of the walls of this tank is a gutter 5 feet wide and 3 feet deep, one side of which acts as a weir for drawing off excess flows. The top of the weir is about 3 $\frac{1}{4}$ feet above mean lake level.

Just outside the skimming tank the outfall sewer drops quickly 9 feet, and then falls 3 $\frac{1}{4}$ feet

in a length of about 550. Here a branch extends upstream and another downstream, each consisting of 80 feet of 42-inch, 95 feet of 33-inch and 40 feet of 18-inch concrete pipe. At intervals of 48 feet along these branches are outlets in the top of the pipe, each outlet being 16 inches square and so formed as to discharge the sewage horizontally at right angles to the pipe. The 18-inch pipe ends in a cast iron elbow rising 30 degrees in a vertical plane. These outlet branches are set in trenches, dredged in the river bottom, 40 feet wide on the bottom and with slopes of 1 on 2, 10 to 20 feet deep below the present river bottom. This provides for discharging the sewage at ten points in a distance of 432 feet.

Note: In the larger table on page 521 of the previous instalment, the names of the cities referred to were omitted. These were, in the order of the columns: Toledo, Milwaukee, Detroit, Buffalo, Cincinnati, Louisville and Fitchburg.

American Water Works Convention

Papers read before the American Water Works Association at the Cleveland Convention described very briefly, and discussion of them and of the "Superintendents' Day" topics.

The papers read at the convention of the American Water Works Association followed almost exactly the program prepared, except that time was not found for three of the nine listed for the opening session on Tuesday morning, to be delivered by members of the local water works department.

A. V. Ruggles described the construction program of the Cleveland water works, L. A. Quayle gave some calculations comparing the relative cost of a reservoir on the one hand and of additional pumping equipment on the other for supplying peak demands. As a conclusion of this calculation he secured certain algebraic expressions for the amount of money that could be expended in building a reservoir, the ultimate cost of which would be no greater than that of providing pumping capacity to meet peak demands, basing his calculations on four types of pumping plants. His general conclusion was that a reservoir or standpipe capable of taking care of the largest part of such demands would in most cases be cheaper than additional pumping capacity.

G. E. Flower described, by the aid of lantern slides, the growth of Cleveland's water works. J. W. Ellms gave the results of a sanitary survey made by him of Lake Erie immediately in front of the city for the purpose of determining the best location for intakes for the new water works; his conclusion being that the locations of the present intakes probably could not be improved upon. The investigation consisted chiefly of repeated bacterial examinations of surface and subsurface waters during a period of several weeks, samples for analysis being taken at the corners of rectangular sub-divisions of that part of the lake under investigation.

Mr. Ellms and W. C. Lawrence had prepared a paper describing investigations made to determine the causes of obnoxious tastes and odors that sometimes occurred in the Cleveland water supply. They concluded that there was little doubt that these were due to the action of chlorine (used for sterilizing) upon minute proportions of tar products which found their way into the lake from certain manufacturing plants.

Mr. Ellms and A. G. Levy described tests made by them with different methods of dissolving sulphate of alumina. They concluded that stirring by paddles or otherwise was unnecessary, but that equally good and rapid results were obtained by merely passing water upward through alum supported on grids or otherwise in the bottom of the tank; the rate of solution depending upon the fineness of the alum particles.

Discussion of these papers had been postponed until all of them had been read and they were then discussed briefly by Messrs. Habermeyer, J. N. Chester and C. A. Brown. Mr. Chester inquired whether, in making the calculation comparing reservoirs and pumping systems, any provision had been made for meeting the requirements of the National Board of Fire Underwriters for fire protection, the reply being that this had not been taken into account. Mr. Brown suggested that instead of a grid for supporting the alum, a hopper bottom might be used with the water entering at the bottom of the hopper and spreading out so as to rise through the alum for the full area of the tank.

TUESDAY AFTERNOON

In the afternoon George H. Fenkell read a paper entitled "The Waste of Water in Detroit," which showed the excellent results obtained there by

the pitometer survey and other efforts of the department. (This paper will be published in PUBLIC WORKS.) This was discussed by Messrs. Brush, Bohman and others.

This was followed by two papers on water rates, one by Nicholas S. Hill, Jr., and the other by E. E. Bankson. After some discussion the authors agreed that there was little difference in the fundamental ideas embodied in the two papers, although they treated the subject from different viewpoints. Mr. Bankson's paper described in some detail the method recommended by him for determining the water rates necessary to enable any given plant to meet its operating costs, overhead charges and other elements of the cost of the service, at the same time allotting to service charge and quantity charge, respectively, the proportionate parts of the total charge which were at the same time logical and practicable. These papers were followed by considerable discussion by Messrs. Hazen, Brush, F. T. Kemble, Ledoux, Burgess and others.

TUESDAY EVENING

The evening session was an innovation for this society in that it was occupied by papers presented by associate members of the society. The first of these was by Charles H. Ade, of the National Meter Company, a considerable part being devoted to a humorous reply to the president's address at the 1920 convention, but later making a plea for the use of water works supplies by water departments without waiting for a further fall in prices, with the suggestion that unless such aid was rendered very soon many of the companies would go out of existence.

Peter Payne Dean described the Payne Dean electrical method of controlling valves, describing installations in connection with standpipes, where the valves were opened and closed from a distance, large valves which were closed much more quickly than would be necessary by hand closing, and other conditions where this control had been used successfully.

F. V. Leopold, of the Pittsburgh Filter & Engineering Company, described the experience of that company in developing the heavy oil engine, warning anyone contemplating the development of a similar appliance that they must be possessed of an abundance of money and patience if they expected to perfect a machine that would be practically successful.

The final paper was entitled "Standardization of Meters," by R. K. Blanchard, of the Neptune Meter Company. He told of the co-operation, which was hastened by war conditions, of the various companies in standardizing sizes of fittings, threads, capacities, etc., of meters of different kinds and makes.

WEDNESDAY MORNING

On Wednesday morning, following the president's address, Col. George A. Johnson read a paper entitled "The Romance of Water Storage," which made a plea that sole reliance should not be placed by any plant upon chlorination, but that all surface supplies should be filtered. This paper was discussed by Robert Spurr Weston,

A. H. Jewell, Richard Messer and others. The water works of Erie, Pa., were described by John N. Chester. In response to a question by M. N. Baker, Mr. Chester stated that the water commissioners who are in charge of the water department of that city are appointed by the county judge, and are thus entirely free from control of city officials and presumably of politics.

Helman Rosenthal, of Dallas, Texas, described some animalcules having many of the characteristics of fleas that developed in enormous quantities on the water works filters of that city. After trying various methods of getting rid of them, the use of liquid chlorine applied before the water was sent to the filters was found to be effective.

Following this, reports of several committees were received. J. M. Goodell, secretary of the Committee on Standard Form of Contract, reported progress for that committee and the committee was continued. The committee on Private Fire Protection Service stated that it had no changes to make in its report of last year, and that it would render a final report next year. The committee on Standard Brass Fittings reported progress. The committee on Revision of Standard Specifications for Cast Iron Pipe and Specials reported that no decision had yet been reached as to the question of uniform outside diameter and other proposed changes, the general opinion of those consulted having been that this was not a suitable time to change specifications, especially in view of the increase in cost which such changes might necessitate.

WEDNESDAY AFTERNOON

An interesting paper was read by Abel Wolman entitled "The Small Plant Operator as a Scientist"; another by H. W. Streeter on "The Loading of Filter Plants," and one by W. A. Sperry discussing "Tastes and Odors with Chlorination."

In a paper entitled "The Quality of Water at Different Points on a Water System," written by Sheppard T. Powell and given in abstract in his absence, it was stated that *B. coli* had been found in an open reservoir of the Baltimore County Water Company, although not present in the water as it flowed into the reservoir, and investigation apparently established that tadpoles were responsible for these *B. coli*, their occurrence having coincided quite closely with the refusal of permission formerly granted to gunners to shoot frogs in the reservoir.

In a paper on State Versus Local Viewpoint on Filter Plant Control, R. B. Morse, chief engineer of the Maryland State Board of Health, made a plea for co-operation and a mutual toleration between local health officers and the officials of state boards. Mr. Goodell, in the absence of the authors, read a paper by Lewis O. Bernhagen entitled "The Education and Training of Water Plant Operators," and one by Charles H. Capen, Jr., entitled "Licensing Filter Plant Operators in New Jersey." Mr. Bernhagen, of the Texas State Board of Health, stated that health officials in that state spent two weeks a year at Austin receiving instructions from the state board in the operation of water purification plants.

Discussing the matter of tastes and odors due to chlorination, N. J. Howard, of the Toronto Filtration plant, stated that they had traced such tastes to phenol compounds; and H. P. Bohmann, of Milwaukee, stated that tastes in that city had been traced to a coke plant which discharged coal tar derivatives into the source of supply. Investigation showed that of the many substances tried, only coal tar derivatives gave the specific taste noticed. He stated that tastes that were due to chlorine alone can be removed by boiling the water, but where the taste is due to phenol the taste cannot be so removed. Mr. Morse stated that at two places in Maryland where tanks had been painted with coal tar paints, tastes were found in the water when chlorine was used. One member expressed his opinion that in many cases operators got careless and used too much chlorine, with the idea of thus making up for a carelessness in operation of the filter plants, and that the taste was frequently due to the excessive amount of chlorine. The subject was discussed by several others, including Messrs. Kent, Orchard, F. W. Green, E. I. Roberts, Jordan, A. U. Sanderson, Allen Hazen and others.

Mr. Jordan called attention to the fact that the Public Health standard of purity of water was not intended for municipalities but only for interstate carriers, but that in spite of the frequent repetition of this statement, many municipalities continued to use this standard. One of the speakers having made the statement that filters of 10 or 15 years ago, without the aid of liquid chlorine or certain other modern refinements, turned out regularly as high quality of water as the present standards demand, Mr. Hazen gave figures to show that the bacterial standards of the present were much higher than those commonly demanded in 1897.

SUPERINTENDENTS' DAY

On Thursday morning the report of the committee on Standard Specifications for Water Meters, Caleb M. Saville, chairman, was introduced for discussion, having been published in the journal of the association for May. There was no discussion and the report was adopted by the convention.

Fred B. Nelson described "A Method of Determining by a Single Flow Test of a Meter Its Capacity at all Pressure Losses." This was done by making the assumption, which he said was almost exactly correct, that the capacity of the meter varied as the square of the pressure. The greater part of the paper was devoted to showing how, by the use of logarithmic paper, the capacity at any pressure loss could be determined by making one test and plotting a line through the point plotted from this test and having a slope of two to one, and other uses of logarithmic paper. In connection with the matter of measuring water, a member asked Mr. Nelson how closely weir results and pipe flow results would check with the standard formulas; replying to which E. S. Cole stated that for a weir, results within one-half of one per cent could be obtained.

The paper on the program entitled "Use of Dynamite in Breaking Out Old Water Mains"

had not been furnished for presentation. B. F. O'Brien in a paper entitled "Tapping Large Steel Mains Under Pressure," stated that to do this successfully required close attention to a number of details. Steel pipe is never truly cylindrical and to get a cast iron collar that would fit its circumference at any point, it is necessary to get a true contour at this point, this including the correct horizontal and vertical diameters, the thickness of the lap, the height of rivet heads, etc. A pattern is made of the section where the collar is to be placed and a casting made of semi-steel (about 20 per cent steel). The collar or sleeve is then set carefully with uniform lead space around the entire circumference, the lead is poured very hot and is calked carefully, going entirely around the circumference several times so as not to deform the pipe. In cutting the hole in the pipe, it is necessary to feed the cutter slowly, carefully and continuously because of the comparative flexibility of the steel. Questioned whether leadite or similar material could be used for calking, Mr. O'Brien recommended lead only.

At this session members were asked to discuss some of the 39 topics suggested. In connection with the third—"Experience with Double Check Valves Between Public Water Supplies and Polluted Private Fire Protection Supplies"—Mr. Ackermann told of his experience in Auburn several years ago, stating that maintenance of the efficiency of the double check valve requires inspection at least once a year, when each check valve should be taken apart, inspected and cleaned. Several members discussed the question, one of them stating that in one instance even deep wells used for private supply by a commercial plant had been found to be polluted and contaminating the public supply, and the general opinion seemed to be that certain safety required total absence of any connection between the two.

Discussing the fourth topic—"Extension of Water Mains into New Developments, How Provided and Paid For"—Mr. Gwinn said that his company required real estate developers to furnish cash in advance for such extensions. Mr. Brush said that in New York, extensions were granted by the municipal plant if there were enough houses along the line to average one for each 100 or 150 feet of main. In his opinion, however, decision should be based rather upon number of families rather than upon the number of houses, since one four-family house would use more water than two one-family houses.

(To Be Continued)

Road Construction In Ohio

The State Highway Department of Ohio is reported to have under contract more than one thousand miles of new highways, and much of this under construction. This includes about 293 miles awarded on May 27. On January 1, 1921, there was still uncompleted about 721 miles of work under contract. More work is to be let in July. All of this is only about one-eighth of the total state and county highways already improved or to be improved. The aggregate cost of work now pending exceeds \$36,000,000.

Excessive Motor Truck Taxation and Restrictions

In an article entitled "Transportation Equality," M. L. Pulcher, vice-president and general manager, Federal Motor Truck Company, says, in part:

"Many states are proposing legislation to limit the load that can be carried by a motor truck to such a degree that thousands of firms and men now owning heavy duty equipment will be forced out of business, and the capital invested in their trucks will be almost a total loss. Also, state and national taxation of motor trucks and passenger cars is being carried to an unreasonable point.

"Motor trucks hauled 1,200,000,000 tons of freight in this country in 1920; that carried by the railroads in the same twelve months amounted to 2,504,000,000 tons, most of the goods hauled by the trucks being also hauled by the railroads.

"As far as traffic laws are concerned, motor truck manufacturers and motor truck operators are agreed that there should be laws governing the gross weight, width and length of vehicle and load, and that the first of these, the weight, should be on the tire-inch basis, but they feel that all states should have a uniform law. Much motor trucking to-day is interstate, and as they are regulated to-day, operators never know whether they are breaking the laws until they are held for some infraction. Indeed, in many states the laws are so unreasonable that all truck owners are automatically infringing on the regulations.

"The Federal Highway Council Uniform Road Law is eminently fair, we believe, to all roads and to all truck owners. This law limits gross weight to 28,000 pounds and 800 per tire-inch, and speeds on pneumatic tires up to this limit of weight to 25 miles per hour. Lesser speeds are provided for different weights on solid tires. Fifteen states have already adopted this law, which is endorsed

by many highway officials and associations. Legislation that limits weight and speed of motor trucks should be the same the country over, the same as that governing rates on common carriers. These laws, properly enforced, would then govern truck operation properly, present undue injuries to the road and be fair to all concerned."

Oxyacetylene Torch for Pipe Welding and Cutting

Economy, convenience, efficiency and rapidity of welding vs. screwed joints. One man and simple outfit can weld 8-inch pipe joint in twenty minutes with maximum cost of 14 cents for gas.

The successful use of the oxyacetylene torch for welding and cutting all sorts of material in manufacture, construction and repair work has developed a large and increasing application to the field welding of joints in gas mains and other pipes instead of making them with screwed sleeves.

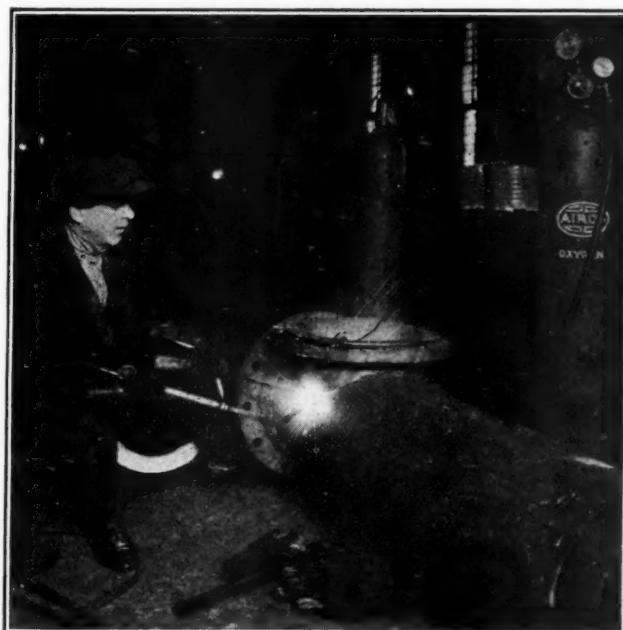
Welding the joints is a simple, easy operation, quickly learned by an intelligent workman and rapidly accomplished under ordinarily favorable conditions. It involves no expensive equipment or elaborate operations and is estimated to cost from 30 to 60 per cent less than an equivalent screwed joint, besides often permitting the use of a pipe considerably lighter than is required for screw joints.

The welded joints eliminate flanges, sleeves, extensions and many special fittings of the pipe, permit the joining of pipes at any angle, make a connection as strong as or stronger than the body of the pipe, and are perfectly watertight and gastight. They are applicable to all kinds of metal and greatly reduce or eliminate electrolysis that is often destructive to screwed joints.

APPARATUS

The equipment consists of a 220-cubic foot tank of oxygen at a pressure of 2,000 pounds per square inch at 70 degrees Fahrenheit and a 275-foot tank of acetylene gas at a pressure of 250 pounds per square inch at 70 degrees Fahrenheit, equipped with hose, gauges, reducing valves and standard torch, and mounted on a hand truck, the whole weighing about 400 pounds and being portable so as to easily follow the pipe line.

Standard pipe of any diameter, with the ends bevelled to an angle of 45 degrees, is assembled together with the ends rigidly held concentric and a small fraction of an inch apart to allow for expansion, and the joints are welded either in the trench or, preferably, on the surface alongside. The pipe should be supported high enough above the ground to give free access to the underside of the joints and should be revolved away from the operator, thus allowing him al-



WELDING T-CONNECTION TO PIPE WITH OXYACETYLENE TORCH

ways to work on the upper side of the pipe, and bringing the completed portion of the joint always just above the flame of torch, which if held at an angle of 45 degrees, produces, without special effort, a joint semi-circular in cross section.

REGULAR OPERATIONS

Only one man is required to operate the torch, but he can be advantageously assisted by another to turn the pipe, although when necessary the joint can be carried around the pipe without turning the latter, an operation which it is estimated costs twice as much as when the pipe is turned, and if conducted in the trench costs 25 per cent more than if done on the surface of the ground.

The beveled edges of the joints expose the wall of the pipe to the easy application of the torch flame which quickly and uniformly heats the metal to the fusing point at the same time that it melts the end of a small rod of the same or a similar metal that is used to provide new material for the joint, the whole being fused into position and making a solid continuous filling integral with both ends of the pipe.

Large diameter pipes are first tack-welded together at four equidistant points while the pipe is stationary, after which welding is commenced at one of these points and continued around the joint, completing the work as the pipe is gradually turned on its axis.



JOINTS WELDED AND END SEALED OF LONG SECTION OF PIPE READY TO BE LOWERED IN TRENCH

It is customary to complete half a dozen joints making one long section on the surface of the ground adjacent to the trench, which is then placed in the trench and assembled with the last section at a point where an excavation is made in the bottom of the trench to give access for the operator. The joints are so strong that they are not injured by the moving and lowering of the pipe, and the stresses occasioned in this way are often considered allowable in order to provide practical tests.

TESTING

In a recent installation of 12-inch and 16-inch steel pipe for 3 miles of double line, and 3 miles of single line, installed in Pennsylvania for the Counties Gas and Electric Company, the joints were welded under the supervision of experts from the engineering service department of the Air Reduction Sales Company, New York, which supplies torches, oxygen, acetylene and other equipment for this class of work. In this job, 15 or 20, 20-foot lengths of pipe were welded together and then the ends were sealed by a transverse diaphragm plate welded on to permit the application of a 30-pound pressure test to detect leaks. After the satisfactory test the seal was removed and another length of pipe added, and so on.

COST AND SPEED

Under ordinary working conditions an expert operator using an Airco "A" Welding Torch equipped with a No. 4 Airco "A" Welding Tip can weld metal $\frac{1}{8}$ inch to $\frac{1}{4}$ inch thick at a speed of 7 feet per hour with a consumption of 12.5 cubic feet of oxygen at a $2\frac{1}{2}$ -pound pressure and 11.5 cubic feet of acetylene at 3 pounds pressure.

With an Airco "D" Cutting Torch and No. 1 Airco Standard Cutting Tip the operator can cut through steel $\frac{1}{2}$ inch thick at a speed of about 80 feet per hour, consuming in one hour 51.75 cubic feet of oxygen and 15.5 cubic feet of acetylene at pressures of 20 pounds and 3 pounds per square inch.

The cost of the gas varies according to the user's consumption, reaching a maximum of about \$2 per 100 cubic feet of oxygen and \$3 per 100 cubic feet of acetylene. In the case of acetylene it is necessary for the user to spend a nominal sum for the purchase of cylinders. The arrangement which Airco has in this connection is to loan its acetylene customers one additional acetylene cylinder for each one purchased. Thus if a man buys one cylinder he is loaned another, which arrangement gives him the service of two tanks at the cost of one. If he buys ten he is loaned ten more, etc. Cylinders are exchanged when empty.

The welding torch is used for numerous purposes in construction and repair work including the welding of steel pressure vessels which must be absolutely tight, for heating kettles, and many similar purposes. The cutting torch is used for cutting off the pipes, for bevelling their ends, and for cutting any structural steel, such as columns, girders, beams, angles, truss members and the like.

PUBLIC WORKS

Published Weekly

by
 Municipal Journal and Engineer, Inc.
 Publication Office, Floral Park, N. Y.

Advertising and Editorial Offices at 248 W. 39th St.,
 New York, N. Y.

Subscription Rates

United States and Possessions, Mexico and Cuba \$3.00 year
 All other countries \$4.00 year

Change of Address

Subscribers are requested to notify us promptly of change
 of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
 Western office: Monadnock Block, Chicago

S. W. HUME, President J. T. MORRIS, Treasurer
 A. PRESCOTT FOLWELL, Editor
 FRANK W. SKINNER, Associate Editor

CONTENTS

CONCRETE BRIDGE CONSTRUCTION—Illustrated	541
DESIGNING IMPROVEMENTS IN TOLEDO'S SEWERAGE	544
AMERICAN WATER WORKS CONVENTION....	546
Road Construction in Ohio	548
Excessive Motor Truck Taxation and Restrictions....	549
OXYACETYLENE TORCH FOR PIPE WELDING Illustrated	549
EDITORIAL NOTES	551
Taxing Motor Traffic—Field Construction Methods and Plant	
COUNCIL ON STANDARDIZATION	552
Tests of Earth Concrete	554
Port Newark Dredging Started	554
HOW TO MOVE PIPE MAINS IN SERVICE.....	555
RECENT LEGAL DECISIONS	557

Taxing Motor Traffic

The hundreds of millions that have been spent in building roads have so far been raised, in most cases, by federal, state and county taxes or by bond issues to be paid off by such taxes. In some states the maintenance of the roads has been paid, for by motor vehicle taxes, but even this has not been universal. During the past year or two, however, the growing opinion that motor vehicles should carry a large part of the burden of road construction as well as maintenance has been embodied in the form of state laws, adopted or proposed. Naturally, many automobile owners and manufacturers are opposing this; such opposition was, of course, to be expected. The argument of one such is given elsewhere in this issue.

There are two general classes of motor vehicles—pleasure and business; the latter being again divisible into those for local town delivery and

trucks for long-distance hauling. Perhaps one family in five owns a pleasure vehicle. If roads are paid for by taxes, the four car-less families help pay for the joy rides of the fifth. (It is generally recognized that rent and prices of food and clothing rise as taxes rise.)

As to the argument that good roads, by encouraging truck hauling in competition with railroads, benefit all by lowering prices, the question arises—do they? Do all benefit or only a few who are so situated or in such business as to be able to do so? Moreover, in the last analysis, is the benefit anything like as great as is generally believed? If the interest and maintenance costs of the roads of a state and an adequate depreciation be charged against the motor traffic of that state and met by an increase in rates for truck transportation, would the showing be favorable compared with rail freight rates? Unless it is, then a few are benefiting at the expense of the general tax-payers.

If and where trucks, after paying their share of all highway charges, can compete with railroads, they are an economic advantage and those pay who benefit. Under present practices it is undeniable that only a percentage of those that pay for good roads, directly or indirectly, benefit by them.

Where the roads and the truck travel over them tap a country that is not served by rail, then there is argument for a partial payment for the road by the district served and whose value is thereby increased. But here again this payment may be made directly in the form of taxes or indirectly in the increases in trucking charges made because of higher truck license fees.

Street railways expect to pay the entire cost of their track and frequently give some service in return for the privilege of using the street. Railways pay the entire cost of both right of way and track. We see no reason why trucks, using the roads for commercial transportation, should not pay their share of the entire cost of construction and maintenance of such roads.

Field Construction Methods and Plant

In municipal work and other kinds of public engineering, there are always two separate but closely related factors—design and execution. Technical colleges have gone to the practical limit in training their students in science and mathematics and in the preliminaries of design. Great machine shops and commercial corporations have highly developed fabrication and machine construction, but comparatively little has been standardized or made available for the ready presentation to the layman student or young engineer of the important features and accepted practice in the field of construction of important public works.

A proper co-ordination of design and construction is essential for safety, economy, rapidity and efficiency. Field construction, although it includes a great variety of work under widely different conditions and with all sorts of appliances,

and demands great courage, ingenuity and experience, can be classified in a comparatively small number of major divisions and is executed almost entirely with standard plant and equipment, the proper uses, combinations and modifications of which are indispensable factors of successful operation. These things are of great variety and are interesting, often spectacular, and are of such importance that space is given in PUBLIC WORKS to many articles describing the building of various municipal structures, and through the department of Construction Questions Answered.

The character of such work, the ordinary requirements, the difficulties most likely to be encountered, the methods which have been developed for executing the work, the plant and equipment that is available for it, the machinery, tools and operations that have become standardized and their applications as illustrated in the building of all sorts of civil engineering structures in this country have been observed, recorded and many of them published in descriptive articles by Frank W. Skinner, associate editor of PUBLIC WORKS, who has prepared these data for student instruction and presented to them before the war in occasional or regular lectures at many engineering colleges. A few of the 40 lectures prepared were revised and delivered this spring at the College of Engineering at Cornell University.

As the data included in them make substantially a review of important features in the special field of PUBLIC WORKS, abstracts of some (omitting most of the illustrations of standard, notable and difficult examples and the repetition of details of the kind always abundantly presented in these columns) will be presented in this and in subsequent issues for the benefit and convenience of the younger engineers and contractor and for the many who have little or no time or opportunity for familiarizing themselves with the essentials and general features of special kinds of work which they are not called upon to specialize in but which they may without warning be called on to consider.

Council on Standardization of of the A. W. W. A.

Report that promises to reform a large part of the committee work of that society.

While the report to the convention of the American Water Works Association made by the Council on Standardization was brief and the discussion of it occupied but little of the time of the convention, the seriousness with which the council has taken up its work and the indications conveyed by the meeting of the council and the proposed committees on the day preceding the convention, all point to the probability that the work of this council will play a very important part in the future activities of the association.

As it states in its report, "The council regards itself as a committee on committees for those

subjects which involve standardization matters"; and it includes among such subjects, methods of water analysis, drinking water standards, load factors for purification plants, colloid chemistry, watershed protection, industrial wastes, pumping station betterments, and in fact, nearly the entire range of subjects that generally come up for discussion at conventions of water works associations.

The council suggests two lines of action for the committees—the making of investigations and the abstracting of reports and papers on current developments. In order that the former may be carried on with success it will be necessary in most cases that some funds be available and suggestion was made during the convention that it might be possible to persuade some wealthy individuals to contribute funds for this purpose, these funds to be expended by a department of water works established in one of the engineering schools. This certainly seems to be a practical suggestion and it is to be hoped that a public benefactor may be found who will make this possible.

We do not understand that it is the idea of the council that the committees proposed by it would monopolize the entire work of the society or take the place of the papers which it is customary to read and discuss at the conventions. It should, however, result in the presentation of committee reports that would be of real value and not merely those of "progress," which word so often means inaction. The abstracts presented by the various committees should be of the greatest value in giving to the members of the association a general knowledge in condensed form of the important events that have taken place in the water works field. These would be published from time to time in the "Journal" of the society, rather than being presented only annually at the convention. To the average water works man it is probable that these abstracts appearing regularly throughout the year would be of more interest, and possibly of more practical value, than the occasional reports of investigations, although the latter might well become prominent as stepping stones in the progress of water works matters.

It is to be hoped that the interest which the society appears to have taken in the work of the council on standardization will not be allowed to die down and that during the coming year the work of the several committees may become organized and a start at least be made in the practical carrying out of the lines of committee work indicated.

Report of Council on Standardization

The Council on Standardization, which was established by the association at Montreal in 1920, has been outlining its work by conference and by correspondence. It has considered it much better to develop a working program which is flexible, yet comprehensive, rather than to have appointed at once a large number of committees without well-defined purposes and with personnel selected without the full consideration desirable. It has

been certain from the outset that no program should be laid out which cannot be followed by committees with individual resources at the command of their members, by the help the association can give, and by the assistance that reasonably can be expected from other sources.

In general, the committees will find it useful to function in two ways. The first is to carry on actual investigations, which may not furnish much information except at intervals. The second is to prepare for publication in the "Journal" brief abstracts of the reports and papers on current developments of importance to the members. The publication of such abstracts can be made of high educational value, and their preparation is an excellent way to secure the co-operation of some of the younger members in committee work. It is suggested that the association should compensate the members who do this work at the rate of about half a cent a word for the abstracts as printed. For some years it is probable that this abstracting of information will be the most productive educational feature of the council's work.

It is expected that each committee will first lay out a program for carrying on the work assigned to it, and will then take up this program with the council. When it has been developed to the satisfaction of the council, the latter will take steps to gain for it the support of the association. The council believes that "practical" committee work should be carried along simultaneously with research, so that water works operators will get the maximum possible benefit as early as practicable from the council's activities. Furthermore, this program will make it practicable for each committee to carry its work forward in the speediest way to the point where the experience of the practical water works men can be drawn upon in order to couple theory and practice in the most helpful way. In this manner a large number of our members will be joining co-operatively in improving water works practice.

The council has held conferences here at Cleveland and has reached the conclusion that the committee work outlined in the attached program should be undertaken. In order to carry it on properly, the council has asked the finance committee to place \$2,000 to its credit in the 1921-1922 budget.

The council regards itself as a committee on committees for those subjects which involve standardization matters. It will be the committees and not the council which shall be given the credit for actual performances, while to the council will fall the task of co-ordinating and stimulating actions along practical lines and of avoiding duplication of effort. It is not to be expected that each committee will produce, year by year, reports of great importance, but it is hoped that all committees will put before the membership concrete statements of progress made in their respective fields, expressed in such a manner as to be readily understood by those interested in a practical way in these subjects.

To get the abstracts under way, a committee consisting of A. L. Fales, J. N. Chester, F. C.

Jordan, R. S. Weston and A. Wolman has been appointed to report to the council by September 15, 1921.

It is understood by the council that such portion of the funds to be reserved for its use as will not be actually necessary will be available for other activities authorized in the association budget for the year 1921-1922.

Attached are the topics and personnel of the committees which have been established with the understanding that each committee has the authority to extend its personnel as it deems necessary.

Mr. Malcolm Pirnie, of Hazen, Whipple & Fuller, 30 East 42d street, New York, has kindly consented to act as secretary of the council.

George W. Fuller, Chairman.

Frank A. Barbour,

Edward Bartow,

George A. Johnson,

George C. Whipple,

Council on Standardization.

Topics and Personnel of Committees

1. Standard Methods of Water Analysis—five members—Jack J. Hinman, Jr., chairman, Iowa City, Ia.
2. Standards for Satisfactory Drinking Water—five members—A. W. Freeman, chairman, Columbus, Ohio.
3. Practical Ranges in Load Factors for Purification Plants—five members—E. E. Wall, chairman, St. Louis, Mo.
4. Colloid Chemistry in Relation to Water Purification—twelve members—R. S. Weston, chairman, Boston, Mass.
5. Watershed Protection—five members—Theodore De L. Coffin, chairman, New York, N. Y.
6. Industrial Wastes in Relation to Water Supply—six members—A. L. Fales, chairman, Boston, Mass.
7. Pumping Station Betterments—four members—Leonard A. Day, chairman, St. Louis, Mo.
8. Physical Standards for Distribution Systems—five members—G. G. Dixon, chairman, Akron, Ohio.
9. Standardization of Services—five members—J. M. Diven, chairman, New York, N. Y.
10. Sanitary Fountains—five members—J. H. Dunlap, chairman, Iowa City, Ia.
11. Testing of Water Works Materials and Supplies—five members, John H. Gregory, chairman, Baltimore, Md.
12. Methods and Records of Water Waste Control—five members—W. W. Brush, chairman, New York, N. Y.
13. Steps Towards Standardizing Stated Quantities for Slides in Meter Schedules—five members—Allen Hazen, chairman, New York, N. Y.
14. Practical Standards of Rules and Regulations of Relations Between Water Works and Consumers—six members—F. C. Jordan, chairman, Indianapolis, Ind.

15. Essential Data for Water Department Records and Reports—(a) Municipal Plants—five members—George H. Fenkel, chairman, Detroit, Mich.; (b) Privately Owned Plants—five members—John N. Chester, chairman, Pittsburgh, Pa.

Tests of Earth Concrete

A few days ago we received the following letter from Duff A. Abrams, of the Structural Materials Research Laboratory, referring to an article that appeared on page 431 of our May 21 issue. We submitted this letter to the Earth Concrete Co. for reply, and append the reply of the president of that company. The copy of the original report of the research laboratory that he sends differs from that published by the company in its circular and copied by us only in the heading. In the copy sent with the letter the words "Taken from Knapp Road, Grand Rapids, Kent County, Michigan," do not appear, but in their stead the words: "For Race J. Macklin, 19 North Clark Street, Chicago, Ill." The description reads as follows: "One block was received. It was cut into five smaller pieces of suitable size for testing. The tests of the four small blocks were made in a 40,000-lb. Riehle testing machine. The large block was tested in a 200,000-lb. Olsen testing machine. The bearing surfaces of the blocks were capped with Plaster of Paris to insure an even distribution of the load. The load was applied through a spherical bearing block."

The copy of the report from the United States Department of Agriculture gives, as the result of the compression test on two samples, one $6\frac{1}{8}$ by $6\frac{1}{8}$ by 8 and the other 6 by 6 by $8\frac{1}{2}$, a strength of 2,438 and 2,213 pounds per square inch, respectively, averaging 2,325 pounds. Date of test, April 12, 1921.

STRUCTURAL MATERIALS RESEARCH LABORATORY

Lewis Institute

1951 West Madison Street, Chicago

PUBLIC WORKS,
New York City.

Gentlemen: Your issue of May 21 contained a report on the use of Earth Concrete which purports to be a copy of a report of tests made by this laboratory. It should be stated that our report has been modified in such a way as to give an entirely different impression from that conveyed by the original report. Your article states that the material tested was taken from the "Knapp Road, Grand Rapids, Kent County, Mich." Our report contained no such statement. We had no information concerning the origin of this material, nor did our report indicate its origin, except that it was submitted by the Earth Concrete Company.

We consider the above-mentioned modification of our report as a deliberate falsification of its contents. We trust you will find it convenient to give the same publicity to this statement that was given to the above-mentioned report.

Tests carried out in this laboratory at 7 and 28 days on mixtures of cement and sand and cement and soil with and without "earthcrete" shows that the "earthcrete" reduces the strength rather than increases it.

Yours truly,

D. A. ABRAMS.

June 17, 1921.

Editor, PUBLIC WORKS,
243 West 39th Street, New York, N. Y.

Dear Sir: We have your esteemed favor of June 15 with which you enclosed a copy of a letter from D. A.

Abrams, Lewis Institute, Chicago, in which he objects to an article which appeared in your journal of the issue of May 21, 1921.

The objection to the article seems to be for the reason that your paper used a laboratory report which was used in one of our circulars, in which we inadvertently referred to the samples which were tested as being taken from "Knapp Road," near Grand Rapids, Mich., a highway built by the Board of Road Commissioners about a year ago; the road was constructed of red clay in which cement and Earthcrete was used, and it is meeting all expectations and taking traffic wear just as well as the regularly constructed concrete slabs which adjoin; it seems to be getting more durable with age, thus supporting our contention that more time must be given samples containing our chemical than is allowed for 7 and 28-day tests; laboratory tests do not tell the tale.

The tests made by the Lewis Institute were from samples cut from a slab taken from this road and shipped direct from this office to the Lewis Institute, in care of Mr. Race J. Macklin, our Chicago representative. We are submitting for your use in the publication of any controversy which may arise from Mr. Abrams' objection, a correct copy of the report received by Mr. Macklin from the Lewis Institute, and from which report the circular matter was taken; you will note that the two reports do not differ except that we did inadvertently use the words "Knapp Road" when we really should have said EARTH CONCRETE. Seems to us that this is a small matter to raise such a hub-bub about. Further, we did offer this same explanation to Mr. Abrams, and discontinued mailing the circular in the form in which it was originally printed; we repeat now that we have no intention of taking any undue advantage of either Mr. Abrams or the Lewis Institute; we have the report that was made on the block taken from the Knapp Road, and we would like to know if it is necessary for this company to furnish an affidavit that the sample did come from that particular construction, and if it is required that Mr. Macklin be called upon to identify the same. Of what particular good is a laboratory test unless it can be made use of?

We are enclosing for your further use if you require it a test made by the United States Department of Agriculture, Bureau of Public Roads, in which the results run almost parallel with those of the Lewis Institute; they do not hesitate to note on their report that the source of material was "Knapp Road, Kent County, Michigan."

We do take decided exception to the statement made in the second paragraph of Mr. Abrams' letter that he considers the "Modification a deliberate falsification of its contents."

In the last paragraph he compares our product with samples tested under laboratory tests made in seven and in twenty-eight days; we contend that this is not giving us a fair test inasmuch as we have a new method of construction by the use of chemicals, and that old and worn-out methods will not apply to new ideas; longer time is required to obtain the petrifying effect of earth matter which we hope to show the scientific world is what we will accomplish.

We thank you for your letter and the information which you have imparted, and trust that if the Abrams' letter is published, ours will appear also.

Very respectfully yours,

EARTH CONCRETE COMPANY,
R. S. GREENWOOD, President.

Port Newark Dredging Started

Work was started a few days ago by the Atlantic, Gulf & Pacific Co. on dredging a ship channel for Port Newark, on the Jersey meadows, and filling in the marsh land of the meadows. This will give a channel 30 feet deep and 200 feet wide to permit ocean steamers to reach the docks and warehouses that it is proposed to build on the meadows. The dredging contract is for \$739,062, while \$133,397 is to be spent for bulkheads to retain the filled material. The work will require about one year.

Construction Questions Answered

Suggestions as to methods, "wrinkles" and appliances that may be used to overcome difficulties arising in construction work. We invite questions concerning such problems that may arise from time to time in the experience of any of our readers. Answers prepared by competent authorities will be published promptly. It is hoped that others who have solved similar problems differently will send us their solutions for publication also; or describe new "wrinkles." If it is only a new way to drive a nail, it may help some one.

How to Move Pipe Mains in Service

May be lowered in trenches by tackle, screw rods, wedges, by jacks or undermining. Submerged pipe lowered by lifting, shifting and slackening off or by pumping.

Pipes of small diameter are relatively so light and their joints are so strong and comparatively flexible that they can be handled with considerable ease and without developing strains likely to threaten their safety. They can therefore have their support removed for comparatively long distance and can be raised, lowered or otherwise shifted without special appliances or application of great power and can even adapt themselves to moderate variations of alignment without serious difficulty so that their lowering or otherwise shifting generally requires merely care and the intelligent use of ordinary facilities, especially if the pipe is above ground or is conveniently accessible by trenching.

For diameters above 6 inches, the weight and rigidity of the pipe increase rapidly while the proportionate strength of the joint decreases while the mass and weight of the mass to be handled are much greater, the operations more difficult and costly, and the risk of injury to the pipe is much increased, often special apparatus is required, or unusual methods and great care, involving considerable expense, especially if the pipe contains liquid under heavy pressure that would cause damage if released, or if it contains steam or gas, leakage of which might have injurious effects or cripple the system which it supplies.

In some cases if the pipe is not in good condition it may be safeguarded by reinforcing before any attempt is made to handle it when under very high pressures, or in specially disadvantageous locations. Where the displacement is very great or very abrupt it may be necessary or advisable to bypass the service entirely and to remove a given section of the pipe bodily and reinstall it in the new location, as has occasionally been done for service pipes for gas and water in New York streets, where it was necessary to displace them a considerable distance transversely to clear the construction of subways, sewers

and other subterranean work. Pipes for the underground tubes for pneumatic postal delivery in New York City required such perfect installation and alignment that, in some cases, no attempt was made to lower them in service, but they were temporarily replaced by other lines until the final alignment could be installed in its permanent location.

SHIFTING SMALL PIPE

The first step is to completely expose the pipe for inspection and any necessary preliminary operations along the full length which must be lowered. This, of course, involves opening a trench deep enough and wide enough to extend to the bottom of the pipe on both sides permitting a thorough examination and giving access to all portions of the pipe. In a large number of cases the pipes have to be lowered a comparatively short distance, perhaps only a foot or two, or to be shifted a similar distance horizontally, or both, to clear a certain obstacle, which can often be done without disconnecting the pipe, by swinging it from a straight line to a long curve, providing the required offset at center and becoming tangent with the original alignment at both ends of the shifted section, which may then be somewhat longer than the portion that is required to be displaced so as to secure small angles of divergence and avoid serious stresses in the pipe or joints. When a long section of moderate size pipe is uncovered it can generally be moved transversely a short distance in the middle by pushing it with bars, wedges or jack-screws, great care being taken to watch the joints and see that no leaks or excessive strains are thus produced.

PIPE UNDER HEAVY PRESSURE

If the pipe is under very heavy pressure, as sometimes for a high pressure fire line or for hydraulic service or for a steam line; or if for any reason a leak would endanger the workman or the safety of adjacent property or of the pipe system itself or its service, great pains must be taken to avoid the possibility of broken pipes or joints due to a change of conditions and very reliable support must be provided before the original support is impaired, reaction abutments at bends must be inspected and reinforced, if necessary, and joints that may possibly become loosened should be secured by collars or clamps on both sides connected by tension bolts to prevent a possible opening there. If the pipe is of very large diameter, or under very heavy pres-

sure, or in a critical position, the operation should be directed by experts and in accordance with careful calculations of the strength of joints, the stresses that may be developed, and the work done according to an exact schedule of safe distances and operations.

In no case should there be any abrupt deflections in the pipe and the movement must be gradual, extending over a long distance from the undisturbed portion of the pipe to the point of maximum displacement and the movement of the pipe between these points must be made in numerous small increments, gradually increasing from zero at the ends, to the practicable safe limit at intermediate points and thence through the middle section of the pipe where they may be continued uniformly to a point where they begin to decrease in reverse order to the point of tangency with the undisturbed pipe.

LOWERING BY SAGGING

For small pipes, uniformly supported on hard, regular, sand, clay or earth, it may be possible to remove the earth to the depth of an inch or so, carefully determined by a gauge, from under the center of the section of pipe and working away from this point in both directions continue to remove it until the pipe sags down to rest on the ground or on blocks of a graded thickness placed under it for the full required length, after which the operation can be repeated again from the center, working both ways for shorter distances, and so on, until the pipe is lowered to a required position, sloping upwards at both ends at a very small angle to its original location. This cannot, of course, be done with very large or heavy pipe or where it is impossible to open the trench wide enough and deep enough to allow for the operations.

LOWERING IN SLINGS, TACKLES AND YOKES

Larger and heavier pipes up to 12 or 16 inches in diameter may often be conveniently supported by manila rope slings suspended at every joint and from beams laid across the trench on the surface of the ground. The slings are carefully pulled taut and securely made fast, and will hold the pipe suspended while the excavation is made under it to a moderate depth, say 1 or 2 feet. The excavation should immediately be followed by blocking and wedging at points close to the slings to support the pipe against any possibility of failure of the slings.

The blocking should be so arranged as to have room on top both for the wedges that actually support the pipe, and for second bearings adjacent to them, which should be carefully leveled up to given elevations very close to the pipe and varying accordingly to the profile of different lowering positions that may be prepared in advance. The wedges can be removed and the slings slackened off to lower the pipe to the new bearings, a new set of elevations prepared and the operation repeated, and so on, until the pipe is lowered to the bottom of the trench, when if it has not reached the required elevation it may

be again supported and the trench extended to a convenient depth and so on, until the work is finished.

If the pipe is too heavy to be lowered by simple slings they may be replaced by tackles with the lead lines carefully snubbed on the cross timbers or otherwise arranged so that they can be quickly unfastened. For heavy pipe this method requires a large number of men and tackles, and the tackles may be advantageously replaced in some circumstances by yokes made with transverse pieces and pairs of vertical screw rods passing between pairs of the cross timbers on the surfaces of the ground and with nuts bearing on them through friction plates that are well oiled to facilitate their turning. The rods should be placed at every joint or oftener and afford a very sure and regular method for lowering the pipe, which is accomplished at any desired rate of speed by a large or small party of men, located at different regular intervals, and going from one end of the line to the other, each of them slackening off the nuts on one or both sides of the pipe from end to end of his section by a given number of revolutions or fractions of revolutions at a given signal, and then repeating, the amount being diminished or the operations omitted at the ends of the pipe in order to provide for the small angle between the tangent and the center of the pipe.

JACKING AND BLOCKING

Under some circumstances it may be desirable to drift small openings in the bottom of the trench under large, heavy pipes, and place cross beams or cradles in them, supported on jacks and cribbing, after which the bottom of the trench between the crossbeams can be removed and the proper bearing for the pipe in its new position can be provided and the pipe lowered to it by jacking down and removing the cribbing. This, of course, is a slow and expensive operation and necessitates the opening of a wide trench to give suitable working space.

REVOLVING CONNECTION

If a long section of pipe of moderate diameter is to be lowered several feet and it is permissible to introduce right angle bends in the pipe it may be practicable and economical to cut out this section from the remainder of the pipe and connect it back again at each end with a U made with four elbows and two straight lengths of 1-2 the vertical offset of the pipe. These elbows are at first connected up in the horizontal plane of the undisturbed pipe, after which the center section of the pipe being properly supported can be held in the original position while excavation is made under it to the required depth and the pipe can be then rapidly lowered to the new position, while the U's automatically revolve from horizontal to vertical position and extend themselves to their new arrangement in the vertical plane through the end and center sections of the pipe. This, of course, can only be accomplished with screw fittings that permit the revolution of the pipe in the elbow joints.

Recent Legal Decisions

PUBLIC WORKS CONTRACTOR'S BOND HELD NOT TO SECURE MATERIALMAN'S EMPLOYEES

The Washington Supreme Court holds, *Neary v. Puget Sound Engineering Co.*, 194 Pac. 830, that one who contracts with a paving contractor to furnish all the sand and gravel needed in the performance of a paving contract is not a subcontractor, but a materialman, although the contract provides that delivery of the material shall be "on the ground as directed and required," and for replacement of any material rejected by the city engineer, and a bond is given to insure performance; therefore employees of such materialman cannot recover on the contractor's bond. The court said: "In many cases under modern conditions materialmen deliver their material upon the works where it is to be used. In our cities lumber and mill work are commonly delivered by the manufacturer to the place where they are to be put into the building, but that should be no reason for holding that the workmen employed by the mill are, if not paid their wages by their employer, entitled to file a lien against the building and the ground on which it stands. . . . The giving of a bond on a contract to perform public work is for the purpose of providing security for those who would be entitled to a lien if the work were private, and to claim under such bond one should be in a position to protect himself by a lien if the work were private in its nature. And therefore, if one employed by a materialman may not claim a lien when the work is of a private nature, he cannot claim under the bond given where the work is public."

DISCRETION IN CONDEMNING RIGHTS OF WAY FOR STREETS—MEASURE OF DAMAGES

Applying the rule that the necessity for condemning rights of way for the opening or extending streets is a matter which has been confided to the decision of the municipal authorities, and their judgment is conclusive upon the courts, unless it be made to appear that the use was palpably private, or the necessity for the taking was without any reasonable foundation, the Kentucky Court of Appeals holds, *Louisville & N. R. Co. v. City of Louisville*, 227 S. W. 160, that evidence which merely tended to show that there were other ways, both near and remote, by which the property in the section served might be reached is not sufficient to authorize the court to substitute its judgment for the judgment of the municipal authorities on the question of necessity. The suit was one by a city to condemn an easement for a street over a railroad right of way, and it was held that the railroad was not entitled to such elements of damage as the maintenance of a switchman's gate and house, and an annual expenditure for crossing protection, etc. The full measure of the railroad's just compensation was the difference in value between the exclusive and joint use of the right of way.

SINGLE OR DOUBLE IMPROVEMENT—CITY SEWERAGE SYSTEM AND DISPOSAL PLANT

The Illinois Supreme Court holds, in a proceeding to confirm a special assessment to pay the cost of a system of sewers for a section of a city, *City of Elmhurst v. Rohmeyer*, 130 N. E. 761, that the sewer improvement was a single and not a double improvement, though it included storm-water sewers draining three natural watersheds. A city or village has the right by one ordinance to provide for a connected system of sewers and drains in and along its streets and avenues whereby they may be improved, and such a system is not subject to the objection that it is a double improvement. *Walker v. People*, 170 Ill. 410, 48 N. E. 1010. The construction of sidewalks on several streets may be provided for as one improvement if all property taxed therefor will receive some benefit from the proposed improvement. *Storrs v. City of Chicago*, 208 Ill. 364, 70 N. E. 347. The construction of another improvement to aid the purpose of the main improvement in contemplation will not render the improvement double for that reason, as in the case of the construction of a sewer for drainage purposes in a sidewalk improvement, or the establishment of pumping works in connection with a sewerage system in order that the latter may serve its purpose properly, or the construction of a disposal plant in order that the proposed system may accomplish its proper purposes. *City of Staunton v. Bond*, 281 Ill. 368, 118 N. E. 47; *Drexel v. Town of Lake*, 127 Ill. 54, 20 N. E. 38.

DISTINCTION BETWEEN RESOLUTION AND ORDINANCE

In a suit on apportionment warrants for a street improvement, the Kentucky Court of Appeals, in *Robertson v. Southern Bitulithic Co.*, 227 S. W. 453, states the difference between an ordinance and a resolution to be that the former prescribes a permanent rule of conduct or government, while the latter is an order of the council of a special or temporary character. The ordinance is the more deliberative of the two and attended with the greater solemnity. In practical operation, however, the distinction between the two depends upon the formalities attending the adoption of the respective acts. Usually an ordinance cannot become effective or be adopted at one meeting.

Under sub-section 14, section 3235 C., Kentucky Statutes, authorizing the organization of a second-class city under the commission form of government, the construction or reconstruction of streets may be ordered by either an ordinance or resolution, so that the extension of time for the completion of work by a contractor on a street improvement may be granted by a resolution, notwithstanding section 3096, authorizing the general council of such cities to provide by ordinance for the improvement of streets and other public ways.

NEWS OF THE SOCIETIES

June 28 — ATLANTA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Election of officers. Georgia School of Technology, Atlanta.

June 28-July 1 — SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Annual convention. New Haven, Conn. Secretary, F. L. Bishop, Univ. of Pennsylvania.

July 15 — NEW ENGLAND ASSOCIATION OF COMMERCIAL ENGINEERS. Annual meeting. Crown Hotel, Providence, R. I.

Aug. 10-12 — INTERNATIONAL ASSOCIATION OF STREET CLEANING OFFICIALS. Annual conference. Hotel La Salle, Chicago, Ill.

Aug. 23-25 — AMERICAN ASSOCIATION OF PARK SUPERINTENDENTS. Annual meeting. Detroit, Mich. Secretary, Emmet P. Griffin, Superintendent of Park, East St. Louis, Ill.

Sept. 13-16 — NEW ENGLAND WATER WORKS ASSOCIATION. 39th annual convention. Bridgeport, Conn. Secretary, Frank J. Gifford, 715 Tremont Temple, Boston, Mass.

Sept. 28 (10 days) — NEW YORK ELECTRICAL EXPOSITION. Seventy-first Regiment Armory, New York City.

Oct. 11-14 — INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual Convention, Atlanta, Ga. Hotel Ansley. Secretary, James J. Mulcahey, Municipal Building, Denver, Colo.

Oct. 24-28 — AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention. Southern Hotel, Baltimore, Md. Secretary, Charles Carroll Brown, Valparaiso, Ind.

Oct. 31-Nov. 5 — NEW ENGLAND ASSOCIATION OF COMMERCIAL ENGINEERS. Power show in connection with INTERNATIONAL TEXTILE EXPOSITION. Mechanics' Building, Boston, Mass. Secretary, James F. Morgan, Devonshire St., Boston.

Nov. 14-18 — AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting. New York City.

LOUISIANA ENGINEERING SOCIETY

A regular meeting of the Louisiana Engineering Society was held June 13, under the auspices of the Louisiana Section of American Military Engineers. The subject for discussion was "The Army Engineer—A Rough and Ready Contractor."

An ordinance has been passed by the Constitutional Convention and will become a part of the Constitution of the State providing for a State Board of Health to be composed of a president and eight members, five of whom shall be from the medical profession and three from such callings as the Legislature may designate. It is becoming more and more generally recognized that the Engineer is, by training and experience, particularly fitted to solve many of the problems, and to direct many of the activities of modern health work, particularly those phases which deal with community sanitation and control of insect-borne diseases, as is evidenced by the fact that the Legislature of a number of States are requiring the appointment of Engineers as members of such Boards.

It was resolved by the Louisiana Engineering Society that it heartily favors the appointment of an engineer fit-

ted by training and practice, to membership on the State Board of Health.

It was further resolved that the Society gives its unqualified endorsement to having a qualified Engineer appointed as a member of the State Board of Health, and expressly requests the Legislature at its next meeting to provide for such appointment.

PERSONALS

W. J. Young, chief engineer and general superintendent for the Alpha Portland Cement Co., of Easton, Pa., has resigned to accept a position as chief engineer for the Standard Lime & Stone Co. and the Washington Lime Co., of Baltimore, Md., both of which companies are controlled by the same interests.

Briggs, B. A., has been appointed superintendent of streets of Colorado Springs, Colo.

Higgins, Lafayette, has resigned as sanitary engineer of the Iowa State Board of Health.

Hood, William, chief engineer of the Southern Pacific Company, on May 2, retired from service after 54 years of railroad building with that company.

Kerrick, James V., is now bridge designer with the Kentucky Highway Commission at Frankfort, Ky.

Myers, Clarence B., formerly with the Pennsylvania State Highway Department, has been appointed assistant engineer of the Philadelphia Bureau of Highways.

Shulde, H. G., has been appointed district engineer of the Pennsylvania State Highway Department, with headquarters at Bedford, Pa.

Smithley, Charles, has been appointed county engineer of Geary county, Kan.

Corwin, J. O., Jr., has been appointed engineer of Travis county, Texas.

Harvey, Bernard C., has been appointed city engineer of Rockford, Ill.

Catlett, George F., has been appointed principal assistant engineer of the Bureau of Engineering, North Carolina State Board of Health, in which capacity he will have charge of the water supply division of this bureau.

McCalman, D. S., has resigned as state highway superintendent of Wyoming.

Schade, Frank P., has been appointed city engineer of Cudahy, Wis.

Lanctot, Theodore, formerly assistant engineer in the public works department, Montreal, has been appointed city engineer of Hull, Que.

Ellerbrook, Carlos E., formerly highway engineer and inspector, Michigan State Highway Department, is now with the Iowa State Highway Commission as highway engineer.

Elliott, Edward G., is now county road engineer of Randolph county, West Virginia.

Rogers, C. J., formerly assistant county engineer of Jefferson county, Ala., has been appointed county engineer.

Chalmers, G. H., of Sudbury, Ont., has been appointed resident engineer for the construction of extensions to the water works system of St. Thomas, Ont., which work includes the construction of a concrete dam and reservoir in Kettle Creek valley.

Martin, D. K., and McRoy, W. W., have been appointed members of the Texas State Highway Commission, and Hubbard, R. M., has been re-appointed chairman of the same commission.

Coleman, Dwight B., has resigned as county superintendent of highways of Cortland county, New York, and has been succeeded by William J. Dwyer. White, G. S., was recently appointed city engineer of Fort Morgan, Colo.

Wade, G. R., has resigned as county engineer of Imperial county, Cal.

Null, G. W., has been appointed office engineer in Division 3 of the California Highway Commission to succeed C. F. Henitz, who is now assistant division engineer to Mr. Winslow.

O'Brien, J. J., was appointed superintendent of highways of Pittsfield, Mass., to succeed the late William J. Mahan.

Livermore, Herbert, has been appointed street commissioner of Johnson City, Tenn.

Galvin, John F., of Richmond, Cal., has been appointed secretary of the California State Highway Commission.

Baier, Nathan H., has resigned from the division of sanitary engineering, New York State Department of Health, to become operator and chemist with the new water purification plant at West Palm Beach, Fla.

Hargis, A. B., has been appointed city engineer and superintendent of water works of Jellico, Tenn.

Ballew, Ralph D., has been appointed manager of Grand Rapids, Mich.

Talbert, C. M., has resigned as director of streets and sewers of St. Louis, after about twelve years of service in this position, which is to be filled by C. H. Fisk, formerly assistant sewer commissioner of St. Louis.

Daggett, Frederick W., superintendent of the Trenton, N. J., filtration plant, died on May 10 in Trenton.

Page, Phineas, Jr., has resigned as highway superintendent of Niskayuna, N. Y., and Charles T. Male will fill his position.

Tong, B. H., has been appointed superintendent of highways of Emmons county, N. D.

Slopansky, W. M., has been elected city manager of Belleville, Kan.

Sefton, F. W., assistant city manager of Wichita, Kan., has been appointed city manager of Salina, Kan.

Caton, J. E., has been appointed city manager of Eldorado, Kan., to succeed Bert C. Wells, who recently resigned to assume a similar position at Atchison.

Rich, R. J., has resigned as county surveyor of St. Louis county, Minn., to become district engineer. His former position will be filled by H. T. Hare.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

UTILITOR ROAD MAINTAINER

This machine, manufactured by the Midwest Engine Co., is a small, low-priced, self-conveying machine with independent power that can be economically and continuously used not only for efficient maintenance operations, but can also be used as a small tractor or truck.

The fundamental purpose of the machine is to drag up the gutters so that the water will run out of the road bed, fill up the ruts, and not make the crown high enough for the water to run too fast. The machine is of simple, sturdy construction, easily operated by a boy of 16 and is so economical that it can be kept constantly at

work on bad roads, improving them in direct ratio to the amount of service it does.

The machine has an 8-foot double blade drag and power to make small cuts with it. It is also equipped with a greater mileage efficiency than that of 3 or 4 horses.

The maintainer is provided with throttle controlled by a variable steam governor, which enables the operator to select the speed best suited to the conditions of the road and soil and to maintain it continuously without further attention. When its power is not used for pulling the drag it may be utilized for tractor or truck service and can haul miscellaneous freight or can

even pull a trailer better than a team of horses.

The continued use of the maintainer on a large percentage of the roads of the United States would keep them in good condition for their ordinary traffic and would prevent the necessity of frequent dragging, the cost of which would be more than paid by the economy of gravel or of broken stone. The expense of operation is so small that in one case a mile of almost impassable road was put into good condition by a maintainer, working 6 hours at a total expense of \$5.

The results of applying the utilitor maintainer to a badly rutted earth road is shown in the accompanying group of



ROAD BEFORE OPERATING UTILITOR MAINTAINER



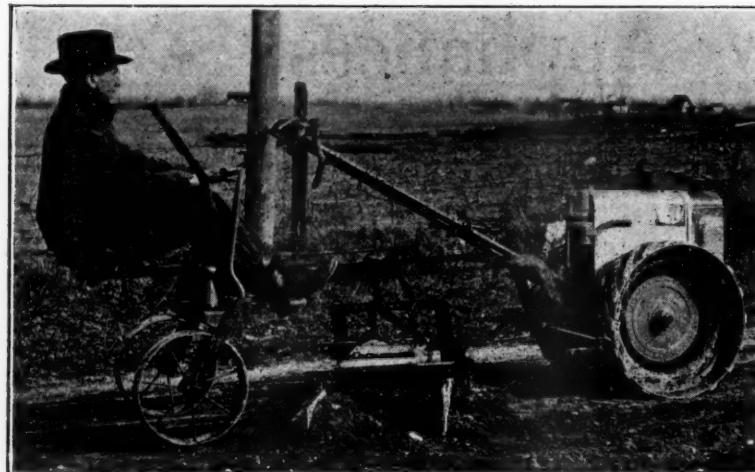
ROAD AFTER OPERATING MAINTAINER ONE HOUR



ROAD AFTER OPERATING MAINTAINER TWO HOURS

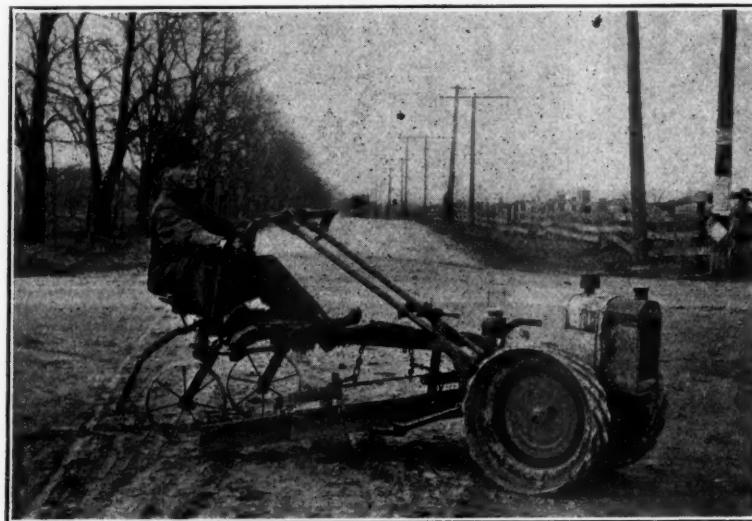


ROAD AFTER OPERATING MAINTAINER THREE HOURS



ROAD MAINTAINER MAKING LIGHT CUT WITH DOUBLE BLADE DRAG

pictures that graphically present the appearance of the surface before the maintainer commenced operations and at successive intervals showing the results of 1, 2 and 3 hours continuous work where the machine had to surmount deep inclines and execute heavy work that was considered a record performance for grade machines.



ROAD MAINTAINER OPERATING OBLIQUE BLADE SCRAPER

work of the maintainer that gradually eliminated the ruts, smoothed the surface and finally provided a uniform regular surface showing only a few superficial marks and adapted for traffic over the entire width instead of in the deep ruts where it was at first confined. Equal or better results can be obtained on a very large mileage of rural and semi-rural roads where at present dragging is insufficient and intermittent, but might be made continuous, profitable, and effective, by the use of a single machine that would be able to patrol a long distance and easily keep the road in good repair after such conditions had once been attained.

STRENUOUS MACHINE GRADING

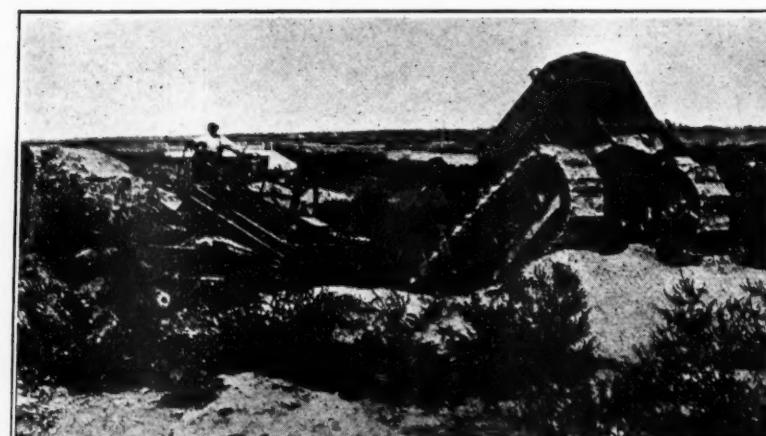
On a 9-mile section of drainage ditch recently constructed in Norman county, Minnesota, 106,000 yards of earth excavated by a ditching machine was in 9 days leveled and graded into a 20-foot roadway by a 10-ton Holt caterpillar tractor pulling a Stockland Giant grader and operating under very great difficult-

portable air compressor mounted on a special truck that is described in bulletin 76-A. It is used chiefly underground to provide a convenient means for converting electricity into air power for the operation of rotator hammer drills, cement guns and other appliances, air drills in remote tunnel working, or pneumatic tools on steel construction, for street railway repair work, for paint sprays or for other work where a little air is required at widely separated points and for relatively brief periods. They can be placed wherever rails can be laid or where hard road is provided, and the operation of the machine requires simply its connection with electric wires and turning the switch. It is a single stage, horizontal compressor operated by gear and pinion from a motor and is of the center crank pattern with all moving parts enclosed in a dust-tight housing and provided with an automatic splash oiling system. The air cylinder is provided with automatic wafer inlet and discharge valves and is jacketed with a water cooling hopper. The fly wheel, of ample diameter, is driven by an inside gear engaging the small pinion on the shaft, which promotes smooth-running.

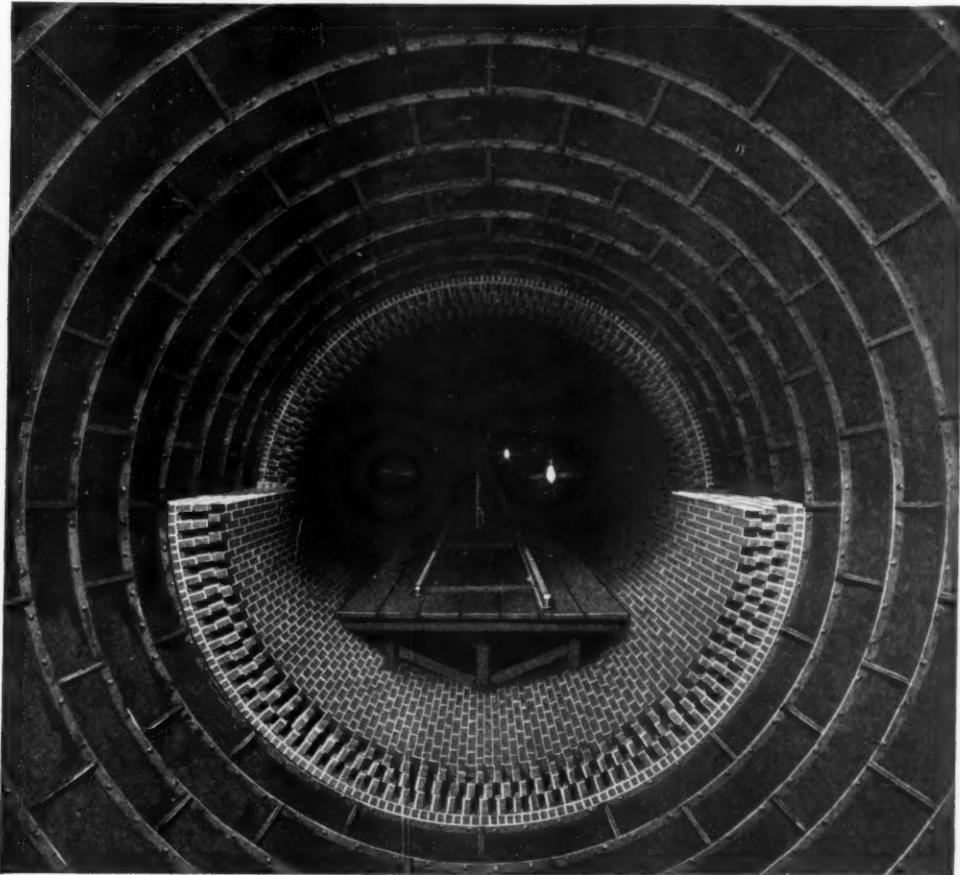
SMITH NON-ТИLTING MIXER

The Smith non-tilting mixers, described in bulletin 455-A and manufactured by the T. L. Smith Manufacturing Co., have wide mixing buckets that pick up the material, pour it into the center of the drum, whence it spreads out and is again picked up and returned to the center, keeping the concrete away from the sides of the drum and eliminating splashing and spilling. A full batch can be discharged in 8 to 10 seconds.

The boiler plate drum is continually kept clean and usually lasts six years or more and is provided with a distinctive single, central gearing containing both roller tracks. It is driven by a cross-shaft and spur pinion and fitted with an automatic measuring water tank and a gated batch hopper, a standard feed chute or a pivoted power loader as required. It can be mounted on trucks with a steam engine or an engine and boiler or an electric motor, or it can be driven by a gasoline engine.



TRACTOR AND GRADER LEVELING 20-FOOT ROADWAY ONE MILE PER DAY



Truscon Tunnel Liner Plates, Seven-Mile Road and Gratiot Ave. Sewers, Detroit, Michigan.
Outside diameter of sewers, 12 ft. to 13 ft. 8 in.

Truscon Tunnel Liner Plates

The modern method of tunneling under ground is to use pressed steel liner plates to support the earth. These liner plates consist of flanged sections which are bolted together, making a continuous rigid shell which can be carried forward a considerable distance in advance of the masonry. They are equally satisfactory if used with brick or concrete. Removable steel forms can be used for the inner face of the tunnel.

Safety to the workers is assured by providing this rigid steel lining. Convenience and economy, together with saving in shoring, result

from the small-sized sections and the rigid continuity secured by bolting these sections together. The entire construction is speeded because of the simplicity in using plates and the fact that the tunnelers can keep in advance of the construction forces.

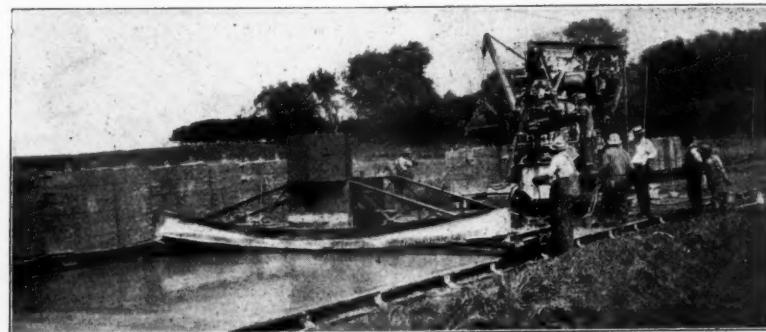
The Truscon Steel Co. has unusual facilities for making Steel Tunnel Liner Plates, as well as a wide variety of steel forms. Our equipment of presses is large and our shops for die-making unexcelled. When figuring your next sewer job get in touch with us and let us quote you prices on Truscon Forms and Truscon Liner Plates.

◆ TRUSCON ◆
PRESSED STEEL

Truscon Steel Company
Youngstown, Ohio

Warehouses and Sales Offices in Principal Cities

Heltzel Steel Road Forms



"Facts, not Sales Arguments, prove an article worthy of your serious consideration."

It's a fact—G. H. Katterjohn & Son, Contractors, Paducah, Kentucky, will use this year the same HELTZEL STEEL FORMS purchased 13 years ago.

That's why we say HELTZEL STEEL FORMS are Durable, Practical and Dependable.

Further, by using HELTZEL STEEL FORMS you are assured of a minimum repair expense bill at the end of the season.

"Simply made—Simply laid."

The Heltzel Steel Form and Iron Company

WARREN

OHIO

AMERICAN BRIDGE COMPANY

HUDSON TERMINAL-30 CHURCH STREET, NEW YORK

*Manufacturers of Steel Structures of all classes
particularly BRIDGES AND BUILDINGS*

Sales Offices

NEW YORK, N. Y.

Philadelphia, Pa.

Boston, Mass.

Baltimore, Md.

PITTSBURGH, PA.

Buffalo, N. Y.

Cincinnati, Ohio

Atlanta, Ga.

Cleveland, Ohio

Detroit, Mich.

CHICAGO, ILL.

30 Church Street

Widener Building

John Hancock Building

Continental Trust Building

Frick Building

Marine National Bank

Union Trust Building

Candler Building

Guardian Building

Beecher Ave. & M. C. R. R.

208 South La Salle Street

St. Louis, Mo.

Denver, Colo.

Salt Lake City, Utah

Duluth, Minn.

Minneapolis, Minn.

Third National Bank Building

First National Bank Building

Walker Bank Building

Wolvin Building

7th Ave. & 2nd St., S. E.

Pacific Coast Representative:

U. S. Steel Products Co., Pacific Coast Dept.

San Francisco, Cal.

Portland, Ore.

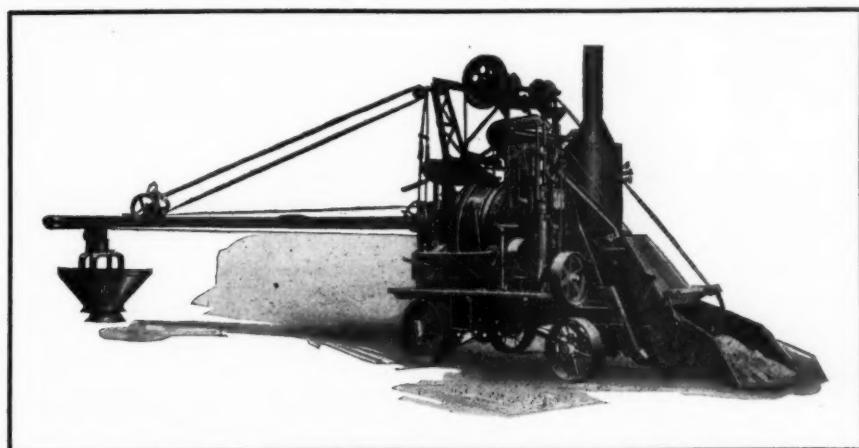
Seattle, Wash.

Rialto Building

Selling Building

4th Ave. So., Cor. Conn. St.

Export Representative: United States Steel Products Co., 30 Church St., N. Y.



"The Standard" Special Street Paving Mixer

A medium sized machine, at a real low price, well adapted to the average road job. It has a capacity of 14 cubic feet of unmixed or 10 cubic feet of mixer material per batch.

THE UTMOST VALUE FOR YOUR INVESTMENT

It reduces the time, effort and expense involved in every operation that enters into the mixing of concrete. Especially adapted for all kinds of road and street work, including the laying of sidewalks, curbs and gutters.

Catalog will be sent upon request.

Ask for catalog No. 63



The Standard Scale & Supply Co.

PITTSBURGH, 1631 Liberty Ave.

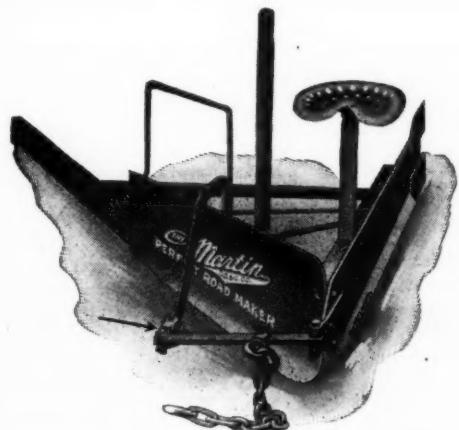
NEW YORK, 145 Chambers St.

CHICAGO, 163-171 N. May St.

PHILADELPHIA, 523 Arch St.

CLEVELAND, 1547 Columbus Rd.

BALTIMORE, 409 N. Gay St.



**Make the Whole Road From
Ditch to Crown As You Go**

With *THE Martin*
D&G CO. REGISTERED

PERFECT ROAD MAKER



"Cutting a Road Through the Fields"

Cleans out side ditches, fills ruts and low places, and grades dirt to center of road at the same operation. Leaves the road about as smooth and hard as an oak floor. A few trips each way—often one—makes the road complete from ditch to crown. Eliminates half the labor of road grading. Cuts costs right in two. Operates with horses or tractor. 5 or 7 ft. blades with 8 ft. steel plated extension. Adjustable for narrow or wide roads. Write for printed matter.

Sold on 10 days' trial

Owensboro Ditcher & Grader Co., Inc.

Box 700

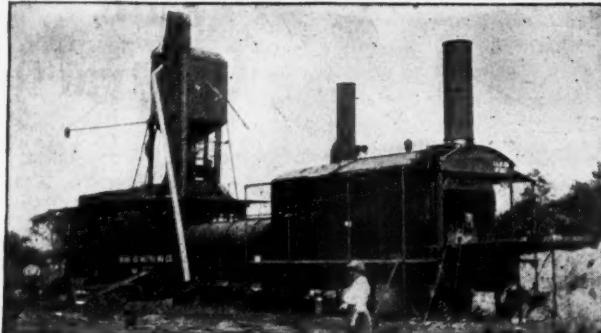
Owensboro, Ky.

COLD PATCH

Maintenance Our Specialty
HEADLEY GOOD ROADS CO.

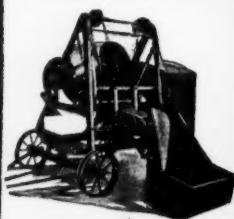
Franklin Trust Building
Philadelphia, Pa.

ASPHALT AND ROAD OIL



**ASPHALT PAVING
PLANTS ALL KINDS
PORTABLE DRYERS
PORTABLE KETTLES
FIRE WAGONS, ETC.
THE HETHERINGTON PLANTS**

ETHERINGTON & BERNER
INDIANAPOLIS, INDIANA, U. S. A.



JAEGER MIXERS—A MIX A MINUTE
FOURTEEN DIFFERENT OUTFITS

THREE DIFFERENT SIZES

The Jaeger line of mixers offers the user the most complete high-grade line ever offered under one name.

THE JAEGER MACHINE CO., 400 DUBLIN AVE., COLUMBUS, OHIO

ET NYRE MOTOR DRIVEN STREET FLUSHERS

are reliable and efficient, and reduce the cost of street cleaning to the minimum.

We furnish complete Motor Truck Flushers, Sprinklers or Oilers in any desired capacity, or Units only for mounting on any make of chassis.

Write for detailed information

E. D. ET NYRE & COMPANY

OREGON, ILLINOIS

Manufacturers of Horse Drawn and Motor Driven
Flushers, Sprinklers and Oilers

The Wyckoff Pipe & Creosoting Co., Inc.

GENERAL CREOSOTERS—ESTABLISHED 1881
Creosoted Wood Block, Conduit, Cross-Arms, Anchor Blocks, Poles, Cross-Ties, Piling, Wharf Timbers, Bridge Timbers, Lumber, etc., Water Pipe, Steam Pipe Casings, Liquor Log. Main Office: 17 East 42nd St., New York, N.Y. Factory: Portsmouth, Virginia

Hard Top Highways—Armor Plate Roads



**The Best Surface
For Long Service**

Willite Road Construction Co. of America
51 Chambers St., New York City

For Rolling Asphalt Use an Erie Tandem Paving Roller.



Having its front and rear wheels exactly the same width, its weight placed principally on the large roll and its steering wheel divided with sections, this roller will prove a money-maker for any contractor who constructs asphalt or brick pavements or low crowned macadam roads. Write for catalog.

Every Erie Roller is guaranteed for a period of five years against faulty material or imperfect workmanship of any kind.

ERIE MACHINE SHOPS
ERIE
PENNSYLVANIA 3



SAVE TIME AND LABOR

By purchasing the
Dependable

**O. S. Locomotive
Crane**

for handling your material. We equip them with various automatic devices for the economical handling of material.

Write for details.
Orton & Steinbrenner Co.
Chicago, Ill.
Factory: Huntington, Ind.



Keep Your Equipment Up to Date

A "man with the hoe" was the original concrete mixer.

You wouldn't think of using such methods now; modern, efficient methods are necessary if your business is to show a profit.

Giant Mixers represent the last word in concrete mixing machinery. They put efficiency in your work and dollars in your pocket.

There are no useless attachments on Giant Mixers to add complications without increasing the output. Giant Mixers are made to mix concrete, quickly and economically.

Send today for the Giant catalog. You will find a mixer that exactly suits your needs in the Giant line, and at a price that will save you money.

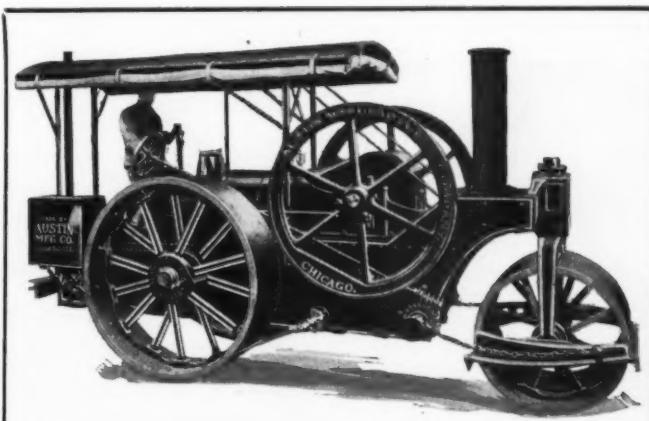
JUDY MANUFACTURING CO.

Box 689-A Centerville, Iowa

Distributors:

Eastern Equipment & Service Co.,
1001 Chestnut St., Philadelphia, Pa.
25 Church St., New York City
Chartrand-Peters Co., 508 Mutual Bldg.,
Kansas City, Mo.
St. Louis Bridge & Supply Co., Frisco
Bldg., St. Louis, Mo.
The Clarence L. Boyd Co., Guthrie, Okla.
Fairbanks-Morse & Co., Denver, Colo.

Service Stations throughout the New England and Middle Atlantic States. Main distributing warehouse at Philadelphia.



AUSTIN MOTOR ROLLER

100% DIVIDENDS In Service and Satisfaction

AUSTIN ROLLERS haven't joined the ranks of the investments that pass dividends in hard times, and they never will.

On the job every minute and staying there for years, they are a sure source of constant satisfaction and profit to contractor or public official.

An Austin Roller is better than the best bond on earth as a guarantee that your work will be done on time and done right.

Three-wheeled Rollers in two types—Motor and Steam—with or without Scarifier Attachment—and in five sizes. Satisfy all requirements and suit all tastes.

Four sizes of Tandem Rollers, but only the Motor type which has proved to be in a class by itself.

Your copy of the New Austin Roller Catalog, just off the press, will be on its way within an hour of the time your request reaches us.

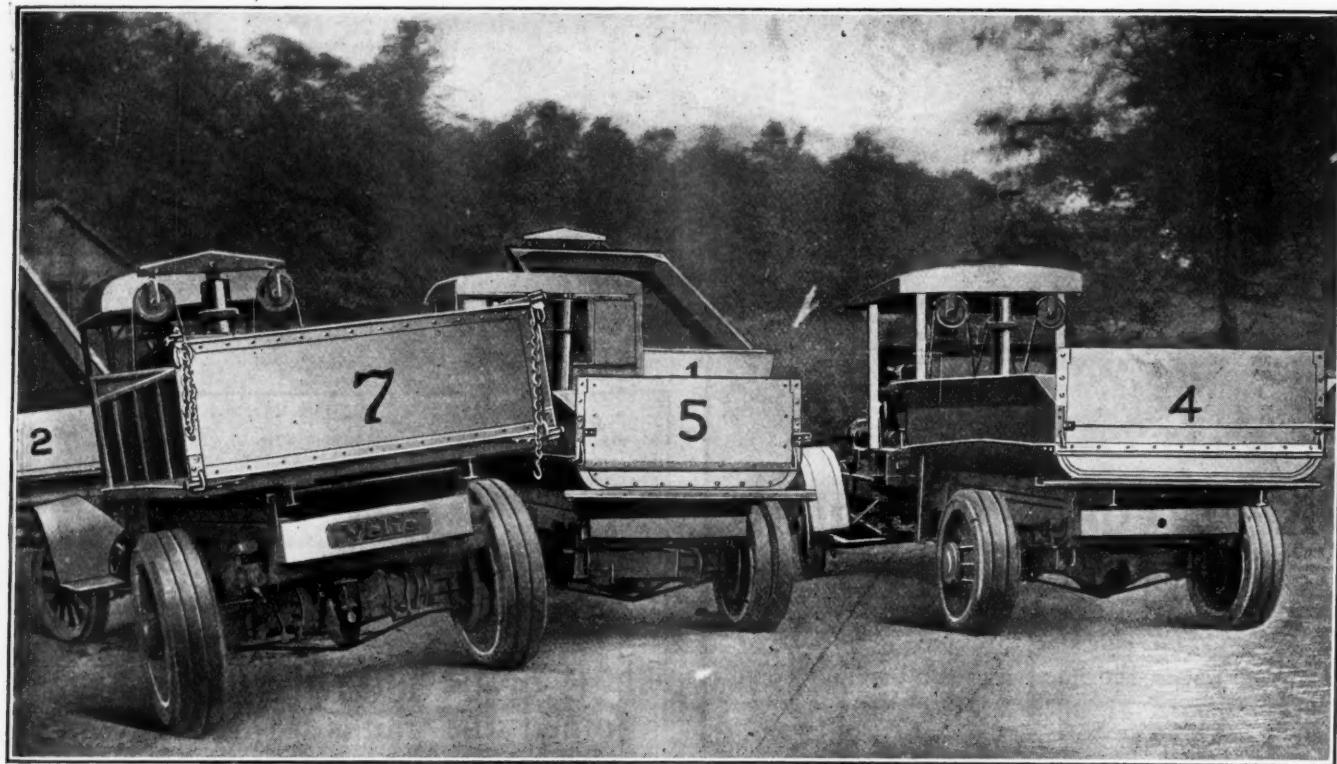
It's worth asking for.

The Austin-Western Road Machinery Co.

CHICAGO

Albany	Los Angeles	Portland
Atlanta	Nashville	Richmond
Billings	New Orleans	St. Paul
Columbus	New York	San Francisco
Dallas	Oklahoma City	Salt Lake City
Boston	Philadelphia	Topeka
Denver	Pittsburgh	Wahoo
Jackson		

EXPORT DEPARTMENT
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
14 Chambers Street, New York, N.Y. Chicago-Almacoa 810-1000



Fleet of Trucks, All Equipped with Standard Steel Dump Bodies, Used by J. E. Kathryn & Co., Kansas City, Mo., for Road Work in Jackson County, Missouri

J. E. Kathryn & Company Recommends Standard Bodies

J. E. Kathryn and Company, Kansas City, Mo., are among the many large contracting firms that are demonstrating the unequalled performance, durability and economy of Standard Steel Dump Bodies on road work and other types of construction.

"The operation of Standard Steel Dump Bodies is satisfactory in every respect," says Mr. J. E.

Kathryn, president. "In road work, as well as other work, Standard Bodies stand up and are always ready to do a day's work. This is what makes heavy hauling more profitable."

We have a *complete* line of Standard Steel Dump Bodies ready to ship, and also make bodies to specifications for special uses. Send name and address—a card will do—for the new Standard Catalogue and price lists.

STANDARD STEEL WORKS
1732 Tracy Avenue
Kansas City, Mo.

Standard Steel Dump Bodies

Advance Contract News

ADVANCE INFORMATION

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

STREETS AND ROADS

Ala., Dadeville **July 6**
For grading, draining and surfacing Alexander City-Jackson Gap road.—W. S. Keller, state hwy. engr., Montgomery.

Fla., Ocala **7.30 p. m., June 28**
For pavements.—Geo. F. Young, city engr.

Ia., Boone **July 20**
For new work and reconstruction of paving.—C. L. Ehrhart, city engr.

Ia., Davenport **2 p. m., July 5**
For improving various sts.—S. R. Murray, chn., Bd. Pub. Wks.

Ill., Springfield **10 a. m., June 28**
For road work.—Clifford Olden, ch. hwy. engr., Dept. Pub. Wks. & Bldgs.

Ill., Centralia **4 p. m., July 12**
For pavement in "Melrose Paving District."—City

Ind., English **2.30 p. m., July 5**
For John Spears et al. and Eli H. Stroud rds.—A. N. Babbitt, Crawford co. aud.

Ind., Madison **1 p. m., July 6**
For Peter Pelsor et al., Wm. Dow et al. and Grant Brittenback et al. rds.—Chas. S. Dibler, Jefferson co. aud.

Ind., Princeton **11 a. m., July 6**
For Mark Armstrong et al. and D. A. Dill et al. rds.—Alfred M. Johnson, Gibson co. aud.

Ind., Shelbyville **10 a. m., July 6**
For Elmer E. Barton, Orville Vernon, Frank Rohm, Iley Tyner and S. S. Montgomery rds.—Walter W. Leslie, Shelby co. aud.

Ind., Beech Grove **8 p. m., June 28**
For improving sidewalks.—Verle Piereson, town clerk.

Ind., Danville **10 a. m., July 5**
For construction of Marion Bailey et al. Hwy. and John Flinn et al. Hwy.—Comrs. Hendricks Co.

Ind., Franklin **2 p. m., July 4**
For the Barnes and Kelch rds.—John C. Gregg, Johnson Co. Aud.

Ind., Hammond **2 p. m., June 29**
For cement sidewalks.—Bd. Public Wks.

Ind., Knox **noon, July 5**
For J. J. Cannon and Chas. Petty rds.—Henry A. Smith, Starke co. aud.

Ind., Columbus City **1.30 p. m., July 6**
For Goss-Lehman road.—Walter K. Burwell, Whitley Co. Aud.

Ind., Goshen **1 p. m., July 6**
For B & O county line and Shaum rds.—Chas. A. Croop, Elkhart Co. Aud.

Ind., Jeffersonville **10 a. m., July 5**
For Ed. Kern rd.—Thos. L. Stoner, Clark county aud.

Ind., Rochester **10 a. m., July 5**
For Jno. W. Miller rd.—Jno. L. McCleung, Fulton county aud.

Ind., Sullivan Co. **noon, July 5**
For three gravel and one rock road.—Frank M. Daniels, co. aud.

Ind., Versailles **1 p. m., July 5**
For Henry H. Gookins et al., Bernard Keen et al. and George Grossman et al. rds.—W. D. Robinson, Ripley co. aud.

Ind., Kokomo **noon, July 6**
For Samuel Lindley rd.—Orville O. Butcher, Howard co. aud.

ITEMIZED PRICES

BIDS ASKED FOR

Ind., Porter Co. **2 p. m., July 5**
For John Runyon et al., Wm. Henry et al. and Allen Barnard et al. rds.—B. H. Kinne, co. aud.

Ind., Winamac **noon, July 5**
For Wm. S. Vollmer rd.—J. C. Howe, Plaski Co. aud.

Ind., Vernon **2 p. m., July 5**
For Thos. Woods and Henry Burgmeyer rds.—Everett Bemish, Jennings co. aud.

Md., Baltimore **11 a. m., June 29**
For grading and paving.—R. Keith Compton, chn., Paving Com.

Mich., Charlotte **2 p. m., June 28**
For State Trunk Line rd. No. 29-2, Section B.—Frank F. Rogers, state hwy. comr.

Minn., Albert Lea **2.30 p. m., July 12**
For state aid job.—Fred Tavis, co. aud.

Minn., Gaylord **1 p. m., July 12**
For state roads.—Fred Hoppenstedt, co. aud.

Minn., St. Paul **10.30 a. m., July 5**
For grading, paving and otherwise improving various streets and for material for this work.—H. W. Austin, pur. agt.

Miss., Tupelo **July 5**
For constructing link of Nettleton-Cardsville road and link of Shannon-Piney Grove road.—J. M. Witt, clk., Lee County Supvrs.

Mo., Kansas City **10 a. m., July 1**
For road work—Leo E. Koehler, co. surveyor.

N. C., Washington **2 p. m., July 6**
For paving Williamston rd.—Gilbert C. White, engr., Durham.

Neb., Spaulding **July 2**
For paving, curbing and guttering.—Prince & Nixon Eng. Co., Peters Trust Bldg., Omaha.

N. J., Belvidere **11 a. m., July 6**
For highway construction.—Morris S. Faust, clk., Board Chosen Freeholders.

N. J., Plainfield **7.30 p. m., July 5**
For paving.—Alexander W. Vars, city engr.

N. J., Sa'lem **1.15 p. m., June 28**
For highway construction.—Ervin G. Ochs, clk., Bd. Chosen Freeholders, Salem Co.

N. Y., Bronx **10.30 a. m., June 28**
For regulating, repaving, etc.—Henry Bruckner, boro pres.

N. Y., Manhattan **2.30 p. m., June 30**
For paving and repaving.—Francis D. Gallatin, pres., Park Board, Dept. Pks.

N. Y., Richmond **noon, June 29**
For sidewalks.—Calvin D. Van Name, boro president.

N. Y., Pittsburg **July 8**
For street and road work.—Bd. Public Works.

N. Y., Albany **noon, July 6**
For improvement and reconstruction of highways in various counties.—Herbert S. Sisson, comr. hwy.

Pa., New Philadelphia **July 11**
For grading and cutting Kuntz rd.—County auditor Baker.

Pa., Somerset **2 p. m., July 5**
For grading, paving and curbing East Catharine st.—C. E. Pile, secy., Town Council.

Tex., Anahuae **June 28**
For grading and surfacing.—H. J. Woldger, engr., Orchard.

Tex., Bastrop **July 1**
For grading and surfacing.—D. M. Puckett, engr.

Tex., Fort Worth **June 30**
For surfacing.—R. V. Glenn, engr., Court House.

Wash., Aberdeen **July 1**
For clearing, grading, draining and paving Pacific hwy.—Supvr. Hwys.

Wis., Shawano **7.30 p. m., July 5**
For paving.—D. E. Wescott, city clk.

Wis., Green Bay **11 a. m., June 29**
For grading and draining Peshtigo-Marinette road.—Wis. Hwy. Com.

Fla., Jacksonville **2.30 p. m., July 1**
For constructing storm sewer.—John S. Bond, chn. City Com.

Ia., Des Moines **9 a. m., June 31**
For sewer connections on W. 5th st.—A. E. McGlothen, city clk.

Ia., Creston **July 12**
For sanitary and storm sewers.—P. K. DeVoe, city engr.

Ill., Wausau **7 p. m., June 28**
For sewers and sewage disposal plant.—E. H. Dahms, secy., Board Local Imp.

Ind., Indianapolis **10 a. m., July 8**
For construction of local sewer.—Bd. Pub. Wks.

Ind., Knightstown **8 p. m., July 5**
For constructing local sewer.—Robt. M. Parker, town clk.

Ind., Indianapolis **10 a. m., July 6**
For sewage disposal plant.—Bd. Sanitary Comrs.

Mans., Boston **noon, June 30**
For sewerage works in Chilton road, West Roxbury.—Thos. F. Sullivan, com.

N. J., Newark **10.15 a. m., June 29**
For pipe, manholes, basins, etc.—T. L. Raymond, dir., Dept. Sts. & Pub Improvements.

N. Y., Boro Bronx **10.30 a. m., June 28**
For sewer.—Henry Bruckner, boro pres.

N. Y., Buffalo **11 a. m., July 1**
For sewers in certain streets—Arthur W. Kreinheder, comr. pub. wks.

N. Y., Brooklyn **11 a. m., June 29**
For sewers in various streets.—Edw. Riegelmann, boro pres.

Wis., Cumberland **July 5**
For sanitary sewerage system and treatment plant.—Bd. Pub. Wks.

Ga., Elberton **3 p. m., July 12**
For water works systems.—Jno. T. Dennis, mayor.

Ia., Des Moines **9 a. m., June 31**
For water connections in West 5th st.—A. E. McGlothen, city clk.

Minn., Canby **8 p. m., June 29**
For construction of tank.—Marvin Ostensee, city clk.

N. Y., Attica **6 p. m., July 11**
For water works improvements.—Bd. Trustees.

WATER SUPPLY

N. Y., Manhattan 10:30 a. m., July 1
For hydrant parts.—Board Purchase, Grover A. Whalen, chmn.

Ohio, Toledo noon, July 6
For centrifugal pumping units, switch board, piping, valves, Venturi meter and other accessories.—C. A. Benedict, dir. Pub. Service.

Okla., Duncan 7:30 p. m., June 29
For reservoir.—Robert Frenzley, city clk.

S. D., Kimball 8 p. m., July 12
For water mains.—C. H. Coxe, city aud.

BRIDGES

Conn., Hartford 2 p. m., June 28
For bridge construction at Mystic river.—C. J. Bennett, state hwy. comr.

Ga., Covington July 1
For rebuilding bridge at Island Shoals, South river.—Co. Comrs., Newton and Henry counties; Dan Upshaw, Covington.

Ind., Washington 2 p. m., July 5
For constructing various bridges.—Daniel I. Myers, Daviess co. aud.

Mich., Detroit 10 a. m., July 8
For bridge across River Rouge.—Ed. Co. Rd. Comrs.

Mo., Kansas City 10 a. m., July 1
For bridge.—Co. Surv., Jackson Co.

N. J., Trenton 11 a. m., July 6
For repairs to bridge over Matawan creek, and other bridge work.—A. Lee Grover, ch. clk., State Hwy. Com.

Ohio, Orrville 1 p. m., July 5
For constructing Horn bridge.—Fred E. Faber, clk., Comrs. Wayne Co.

Ohio, Tiffin July 6
For bridge in Bloom twp.—J. H. Morcher, co. aud.

LIGHTING AND POWER

Neb., Lincoln 10 a. m., July 15
For construction of water and light plant.—Theo. H. Berg, city clk.

N. D., Grand Forks 10 a. m., July 5
For addition to power plant.—Chas. Liessman, secy., Board Administration of State.

N. Y., New York noon, Aug. 14
For Morwell power scheme.—Bur. For. and Domestic Commerce, U. S. Dept. Commerce, 734 Customs House, N. Y. C.

Ohio, Wapakoneta noon, July 12
For power plant and equipment.—R. H. Rogers, dir. public service.

FIRE EQUIPMENT

N. D., Wahpeton 8 p. m., July 5
For triple combination fire truck with complete equipment.—S. H. Murray, city aud.

N. J., South Orange 7 p. m., July 5
For hook and ladder.—Edward R. Arclarius, twp. clk.

Ohio, Toledo noon, June 28
For fire hose and couplings.—Jos. J. Judge, comr. purchases and supplies.

Wash., Puget Sound July 6
For fire alarm system addition.—Bur. Yards & Docks, Navy Dept.

MISCELLANEOUS

Fla., Jacksonville 10:30 a. m., June 28
For dredging in St. Johns river.—J. S. Bond, chmn., City Com.

Fla., Miami July 20
For piers at municipal docks.—C. W. Murray, city engr.

Ind., Brownstown 2 p. m., July 9
For constructing drain.—Elias B. Douglass, supt. construction, Jackson Circuit Court.

Minn., Redwood Falls June 28
For Ditch 72.—F. H. Anthony, engr., structuring Quartermaster, Philadelphia.

Minn., Ada 11 a. m., June 28
For spillway on main branch judicial ditch 56, Norman and Clay twps.—A. C. Houglium, Clay co. aud.; D. E. Fulton, Norman co. aud.

Mont., Savage 2 p. m., July 15
For canal extension, laterals, etc.—U. S. Reclamation Service.

Mont., Great Falls 2 p. m., July 10
For canals and laterals on lower Yellowstone project.—Geo. Stanford, mgr., Sun River Project, Reclamation Service, Savage, Mont.

N. Y., Manhattan noon, June 30
For new bulkhead wall at Battery pl., North river.—Murray Hulbert, comr. of docks.

N. Y., Manhattan 8 p. m., July 12
For shafts for vehicular tunnel under Hudson river.—N. Y. State Bridge & Tunnel Com., & N. J. Interstate Bridge & Tunnel Com., Room 617, Hall of Records.

Ohio, Cincinnati noon, June 29
For cement.—Ernst Von Bargen, city pur. agt.

Work Contemplated

STREETS AND ROADS

Ala., Montgomery—State Hwy. Dept. estimates proposed projects in ten counties to cost \$2,000,000.

Ala., Tuscaloosa—State will soon advertise for bids for construction of Byler road, also bids will be asked for bridge across Warrior river, \$500,000.

Ala., Tuscaloosa—Kaul Lumber Co. have completed survey for its logging road.

Ala., Birmingham—Ordinance passed to provide certain improvements on 24th st. N. A. Barrett, pres. of com.

Alaska, Juneau—Up to this time there has been allotted for road work in the First Division by Bureau of Public Rds., \$110,000, state R. J. Somers, secy., Ter. Rd. Coms. The most important allotment is for the Glacier Hwy. project, connecting Juneau, Mendenhall Glacier and Auk Lake at a cost of about \$34,836.

Ark., Little Rock—Federal Aid for 5 road districts in Arkansas approved, aggregating \$238,550.

Ark., Morrilton—Paving of streets to cost \$125,000, will begin in September.

Cal., Sacramento—New joint counties highway bill signed for good roads throughout Sacramento Valley. New rd. proposed for construction.

Cal., San Francisco—Van Ness ave. will be extended.

Cal., San Francisco—Ordinance passed to improve streets.

Cal., Quincy—Survey will begin at once to ascertain cost of road between Indian Falls & Twain Plumas Co.

Colo., Colorado Springs—City plans paving of various street intersections on Cascade ave., at cost of \$30,000. W. L. Hoffeditz, city engr.

Conn., Manchester—Bd. of selectmen will ask for \$10,000 additional appropriation for hwy.

Conn., Hartford—\$35,000 appropriation approved for paving of Washington st.

D. C., Washington—Road construction projects in Sumter and Washington counties, involving expenditure of \$475,588, forwarded by Federal Bureau of Public Roads

Fla., Tampa—Board Co. Comrs. issued orders to have plans, etc., made for \$160,000 system of roads in Gulf shore Special Road & Bridge District.

Fla., Orange Co.—Citizens propose to construct roads, \$2,300,000. Bond election for July 10, \$2,500,000.

Fla., Emerald—Contemplating road construction from Lisbon to Emeraldo. Orange ave. also to be extended.

Fla., St. Petersburg—It is proposed to expend \$1,000,000 on road construction and improvement.

Fla., Palatka—Forty blocks of new street paving contemplated this summer.

Ga., Rome—County board decides to take over about a mile of new Lindale Road for completion.

Ga., Lyerly—Meeting held to urge and devise plans for building connecting highway from Summerville to Menlo and Fort Payne Mentone Hwy. in Ala., \$60,000 cost.

Ia., Davenport—City plans to excavate, curb and repave Marquette st., \$2,620.

Ia., Dubuque—Resolution passed to improve Bluff st., also recommendation for portions of sidewalks to be constr. on Cox st.

Ia., Marshalltown—Council adopted resolutions calling for 7 blocks new paving and reconstruction of two and a half blocks of old paving.

Ia., Davenport—Official notice of intention to pave various streets.

Ia., Davenport—Rd. bonds \$480,000 to be placed on market very soon.

Ia., Boise—County plans to grade 100 miles of roads this summer.

Ia., Pocatello—D. P. Olson, director of hwy., has outlined a road-building program for the coming year of about \$120,000.

Ia., Wallace—Bids will be opened at Wallace for 5 1/2 miles of road construction over new grade to cross divide between Wallace and Montana side. Expected road will cost approximately \$50,000.

Ia., Boise—Federal appropriation of \$100,000 will be asked for Utah-Idaho-Yellowstone Hwy.

Ia., Boise—Bannock county plans for coming year road projects totaling \$120,000 in cost, states D. P. Olsen, dir. of hwy.

Ill., Decatur—Plans in progress for construction of 6 miles sidewalks, also paving, \$390,000 for road work and bridges.

Ill., Decatur—City council intends to pave block in West Forest ave.

Ill., Danville—Plans to expend \$25,000 to purchase equipment for road building.

Ill., Decatur—State Aid Road Comm. considers construction of hard roads in Macon Co.

Ill., Davenport—Plans prepared for re-location of Davenport-Princeton rd., \$32,000.

Ill., Silvis—Local Board considers paving 5 streets

Ill., Rock Island—City Comrs. considers paving 14 avenues with brick at cost of \$32,144.

Ind., Columbia City—City Council approved road to north and main street, 8 miles.

Ind., Indianapolis—Resolutions passed to re-advertise bids on paving, curbing and boulevardizing certain sts.

Ind., Indianapolis—Board Pub. Wks. authorizes resurfacing of 5 sts.

Ind., Delaware Co.—Treasurer Earle H. Swain will offer at Muncie, on June 27, a road bond issue of \$69,200 bearing 5 per cent.

Ind., Marshall Co.—Treasurer Charles F. Cooper will offer at Plymouth, on June 28, a road bond issue of \$23,190, bearing 5 per cent.

Ind., Spencer Co.—Treasurer Frank M. Harter will offer at Rockport on July 5, a road bond issue of \$9,300 bearing 5 per cent.

Ind., Allen Co.—Bond issue of \$90,000 purchased by Lincoln Trust Co., Fort Wayne.

Ind., Tipton Co.—Bids soon called for more road trucks.

Ind., Indiana—Plans for resurfacing of street ordered.

Kans., Kansas City—City Planning Comm. consider widening of Holmes st., also widening of various sts.

Kans., Leavenworth—Bd. aid amounting to \$20,000 was granted by State Hwy. Com. to county to construct 2 miles hard surface road.

Kans., Topeka—State Hwy. Comm. has \$190,000 in Federal Aid to distribute to various counties for road construction

Mass., Boston—City finance committee has awarded highway loan of \$60,000 to Merrill Oldham & Co., Boston.

Mass., Boston—Board of Street Comrs. give notice of improvement of three rds. consisting of layout and construction, as a highway.

Mich., Northville—Range of bids on gravel highway were \$9,000 to \$13,000 per mile. Contracts awarded later.

Mich., Charlotte—It is proposed to rebuild Federal Road in Eaton co., 7 miles in Bellevue and Walton twps.

Mich., Owosso—City Comm. approved bond issue for paving and curbing, \$45,000.

Minn., St. Paul—Additional improvements planned for Trunk hwy., \$1,750,000. Early call for bids expected.

Minn., Warroad—Grading and gravel surfacing on 12-mile stretch on State Trunk Hwy. No. 11 between Warroad & Roosevelt ordered by Hwy. Comr. Babcock. Estimated at about \$60,000.

Minn., St. Paul—Cook Co. receives \$15,000 appropriation for highway imp.

Minn., St. Paul—\$15,000 appropriated by State Board of Relief to construct rd. from present highway to Grand Marias.

Miss., Hattiesburg—City will pave Adeline st. Address W. E. Estes, clk.

Mo., Kansas City—Board Pub. Wks. passes resolution to pave widened portions of Troost ave.

Mo., Kansas City—Bd. Pub. Works passes resolution for paving and widening portions of Troost ave.

Mo., Kansas City—Park Board approved plans for paving driveway at entrance.

Mo., Kansas City—Approximately 6,000 miles state roads to be improved.

Mont., Missoula—Ordinance No. 490-A passed creating special improv't. district No. 46, comprising grading of Blaine st., constructing concrete sidewalks and curbs, etc. Protests to be heard later.

N. C., Raleigh—State High Coms'n has decided upon the erection of two rock crushing plants at an approximate cost of \$200,000. The Commission also ordered the immediate construction of the Charlotte - Statesville - Davidson rd. of 45 miles.

N. C., Charlotte—Plans being made to eliminate grade crossings in Mecklenburg Co.

N. C., Wilmington—Co. Comrs. receive petition to construct new road to connect Scotts Hill and Middlesound with Wrightsville.

N. C., Hickory—Co. Comrs. plan to hard surface Central Highway. State will appropriate \$125,000.

N. C., Hendersonville—County purchases \$15,000 worth of road machinery for contemplated road improvement.

N. C., Mooresville—The North Carolina Highway Commission authorized the construction of the Charlotte-Statesville Highway. Estimated cost approximately \$1,000,000.

Neb., Lincoln—Ordinance passed to grade 23 sections of sts.

Neb., Valentine—K. C. Madden, Prospect, engr. for Valentine Sparks state road project receives orders to add 4,000 ft. to highway surfacing.

N. H., Manchester—City will consider the issuance of bonds to amount of \$150,000 for highways and \$50,000 for sewers.

N. J., New Brunswick—Middlesex Co. has sold road improvement bonds of \$262,000. Will proceed with Mile run culvert and pave West ave.

N. J., Trenton—An appropriation of \$7,000 will be called to pave Sauhican drive.

N. J., Hillside—Ordinance passed to open Westminster ave. as public street.

N. J., Rahway—City Comrs. pass ordinance for laying concrete pavement and curb in Central ave. at cost of \$14,866.

N. J., Ocean City—Board Public Wks. orders advertisement for bids on bldg. portion of alley.

N. J., Union Twp.—Ordinances passed to construct sidewalks on 3 streets.

N. J., Newark—East Orange Plan body proposes new highway.

N. J., Newark—Ordinance passed authorizing issuance of \$250,000 public improvement bonds.

N. J., Rochelle Park—Board orders advertising for bids for resurfacing Sheridan ave.

N. J., Atlantic City—\$150,000 sought for road construction contemplated.

N. J., Atlantic City—Ordinances passed to issue \$13,000 bonds for extension of Oriental ave.

N. J., Burlington—Work will soon begin on improving High st.

N. J., Hamilton Co.—Ordinance passed to construct curbs and sidewalks on 12 sts. W. C. Rockhill Hart, twp. clk.

N. Y., Fairport—Citizens authorize paving of West ave., \$40,000.

N. Y., Williamsburg—City will improve two streets at cost of \$39,000.

N. Y., Boro Brooklyn—Board of Public Works plan to grade and pave Brighton ave.

N. Y., Boro Brooklyn—City plans to change grade of Van Sinderen st.

N. Y., Boro Queens—Local Board plan to grade, curb, flag and pave 80th st.

N. Y., Boro Bronx—Local Board plan to curb, flag, etc., six streets.

N. Y., Boro Bronx—Additional appropriation of \$20,000 for repaving roadways in Parks.

N. Y., Boro Manhattan—Board Estimate and Apportionment decide to adjust street dimensions.

N. Y., Boro Queens—City Board of Estimate plan changing lines and grades various streets.

N. Y., Boro Richmond—Hearing called for changing grades of 3 streets.

N. Y., Boro Bronx—Resolution passed to change lines and grades at approach to 241st st. Viaduct.

N. Y., Oswego—\$100,000 allotment for secondary system of roads made. Plans for repairing of roads this year. Permanent work next year.

N. Y., Oswego—Construction work on proposed Normal School highway may be delayed until next year.

N. Y., Rochester—Ordinances passed to widen two streets at cost of \$212,000.

O., Ironton—Bid for improvement of 6 streets rejected. Will readvertise.

O., Akron—City council considers construction of North Hill viaduct.

O., Toledo—Resolution passed to improve Worthington st. by paving.

O., Toledo—Petition received for improvement of alley by grading.

O., Middletown—Resurfacing of Middletown pike with sheet asphalt, \$131,500.

O., Warren—Contemplating Jones rd. 1 1/2 miles, draining, grading and bridging.

O., Warren—Bids called on \$88,000 bonds until July 5, for improving of rds.

O., Tiffin—City plans to brick Circular st. and Melissa st. with macadam, conc. curb and gutter. South Jefferson st. and other streets to be improved.

O., Mt. Vernon—Four streets will be improved.

O., Jefferson—Five miles county rds. from Bushnell to Piermont twp.

O., Hamilton—Plans prepared for Mt. Pleasant Pike, \$200,000. Frank Weaver, eng'r.

O., Bucyrus—Scott road to be improved, loose macadam, \$9,000.

O., Paulding—Curtis A. Woods, aud. of Paulding Co., will receive sealed proposals to July 1 for the sale of an issue of \$208,000 of highway bonds.

O., Urbana—Salem twp. residents object to proposed improvement of State Road, \$126,000 Fed. Aid for project.

O., Wellsville—City plans to pave Wells ave. paving block on conc. base.

O., Youngstown—Plans in progress for Coitsville twp. road improvement.

O., Liverpool—Various roads to be improved, contemplated.

O., Magnolia—Plans being prepared for new road. \$60,000 bonds sold.

O., Niles—\$75,000 bonds proposed for widening streets.

O., Hamilton—Middletown Pike to be improved, \$148,000.

O., Cleveland—Marshall Farms Co. will purchase property one mile west of the corporatin line of Ashtabula Harbor. The property will be developed with an amusement park, a country club and an allotment, converting it into a summer home colony.

O., Toledo—Council Public Improvement Committee will readvertise for bids for construction of the Grande Ronde highway project.

O., Findlay—City Council decided upon a street improvement program calling for an expenditure of more than \$100,000.

O., Toledo—Council authorized a \$125,000 bond issue to motorize a portion of the division of streets equipment, including that used in garbage collection.

Ore., Hood River—County votes \$350,000 bonds to cover construction of county roads.

Ore., Portland—Mount Hood loop rd. will be cleared and graded this season for the 23 miles between Multnomah co. line and Zigzag. It is possible that part of it may even be macadamized this yr.

Ore., North Bend—One of the new improvements contemplated this summer is an auto truck road up Sixes river to Inman Minig Co.'s property, grading, estimated, \$20,000.

Ore., Amity—The City Council passed a resolution of intention to improve Jel-

PUBLIC WORKS

VOL. 50, NO. 26

lison street, by grading and draining. W. R. Osborne, recorder.

Pa., Philadelphia—Municipal street cleaning is planned for this city.

Pa., Harrisburg—Construction of Carlisle to Boiling Springs road expected to be started in few weeks.

Pa., Blacklick—\$80,000 bonds for road purposes carried at recent election.

Pa., Erie—No bids received in county road bond issue of \$500,000.

Pa., Warren—Fourteen miles of improved highway to be submitted for bids very soon.

Pa., Harrisburg—State Hwy. Comn. discuss the three roads to be made in Cumberland county.

Pa., Pittsburgh—Co. Comrs. approved \$1,886,000 program for road improvement in Allegany county.

Pa., Philadelphia—Advertising for bids on second portion of big repaving program will begin soon.

Pa., Erie—County will soon advertise for bids on \$500,000. Bond issue for paving and construction of roads.

S. C., Bennettsville—\$180,000 bonds carried in recent election for improvement of roads.

S. C., Fort Mill—Citizens voted in favor of a bond issue of \$75,000 for the purpose of constructing road imprvts.

S. D., Watertown—Bids will be asked soon for the paving of Maple st. and Third st., Northwest.

Tex., Harrisburg—City election June for bonds of \$15,000 for street paving carried. \$85,000 sewer also carried.

Tex., Chambers—\$50,000 road district bond issue ordered July 2.

Tex., Lamb—\$50,000 bond issue for road improvement carried.

Tex., Floyd—\$100,000 bond issue defeated.

Tex., Houston—Sands & Hawley have been appointed City Engrs. of Breckinridge to superintend the expenditure of a bond issue of \$900,000; \$600,000 will be for permanent city pavements and \$300,000 for a sewer disposal plant.

Tex., Texarkana—Contract for the remaining \$300,000 of road work has not yet been awarded.

Tex., Ennis—This city will create a system of public parks commencing with a 15-acre tract 2 miles west of town. An athletic field will be built, a natatorium, tennis courts, and children's wading pools.

Va., Lynchburg—Council authorized appropriations of \$50,000 for paving 5th st. from Main st. to Park ave.; \$10,000 for conduits for electric wires under sidewalks in 5th st.

Wash., Okanogan—Local improvement district has been created and plans completed for laying out and concrete sidewalk nine blocks in the residence section.

Wash., Spokane—County treasurer reports whole of Spokane county \$550,000 county road bonds, covering 1921 building program, sold.

Wash., Yakima—Co. Comrs. decide to close gap in Inland Empire Hwy. bet. Buena and Granger. The county will spend \$150,000 and the state \$90,000 on the project.

Wash., Seattle—Ordinance passed to improve two streets and alleys. E. M. Street, clerk.

Wash., Ellensburg—\$100,000 expenditure on Blewett Pass contemplated.

Wash., Missoula—New road planned penetrating valuable timber district.

Wash., Spokane—County Treasurer E. R. Innis reported recently that all of the \$550,000 of Spokane County road bonds for this year's road program had been sold.

Wash., Spokane—Harry Baker, county engr., states \$40,000 must be expended on Sunset Hwy. west of Spokane to eliminate several dangerous curves.

Wash., Seattle—Lake Hwy. construction contemplated, \$200,000 to \$290,000.

Wis., Hurley—Road bonds \$29,500 sold to Chas. H. Coffin, Chicago.

Wyo., Laramie—The Rocky Mountain Highway Association was formed at Laramie, headed by P. C. Spencer, of Lander, Wyo., for a road to extend from Denver to the Yellowstone National Park, a distance of 563.7 miles.

Wyoming—Proposals received until July 6th for \$1,800,000 Hwy. Bonds. A. D. Haskins, State Treas.

Ont., Windsor—By-laws totaling \$90,000 were authorized here for the construction of sidewalks and \$30,000 bonds were voted for a new police station at Park and Goyeau sts. It is also planned to erect a municipal asphalt plant in this city.

SEWERAGE AND SANITATION

Cal., Los Angeles—Plans are being prepared for constructing 5.17 mi. storm drainage system, large rein.-conc. drns. and vitr. pipe laterals from Madison ave. and Temple st. to point south of Pico st. About \$2,000,000.

Cal., Los Angeles—Plans are being prepared for building 7.65 miles main line sewer in 23d st. from Hooper to Maple aves., also 44.95 mi. laterals and storm drains in West Jefferson st., etc. About \$4,000,000. J. T. Griffin, City Hall Annex, engr.

Cal., LaVeta—Town rejected bids building sewage disposal plant in Dist. 1, involving 12,420 ft. 6-12 in. vitr. brick pipe. Work will be readvertised. About \$25,000. F. H. Brooks, town engr.

Conn., Westfield—City Council decides to construct sewers, \$200,000.

Ia., Creston—City plans to build 4 mi. sanitary and storm sewers. About \$50,000. P. K. DeVoe, city engr.

Ia., Dubuque—Resolutions passed to construct sanitary sewers in two sts.

Ill., Chicago—City intends to construct sewers in various streets.

Mass., New Bedford—City plans to extend sewerage systems in various sts. About \$150,000. W. H. Rennington, city engr.

Mass., Ludlow—It has been decided to extend vitr. sewerage system. Cost between \$25,000 and \$30,000.

Minn., Gilbert—Bids will soon be opened for sewer construction, curbing and cement sidewalks. Est. cost, \$90,000.

Minn., Stillwater—City having plans prepared constructing outlet sewer in Mulberry st. About \$57,787.

Minn., Copper City—Election called to vote \$10,000 bonds for construction of general system of sewers, June 27.

Mo., Independence—City voted \$130,000 bonds and having plans prepared for 3 disposal plants and ejector stations.

Mo., Marceline—City plans constructing sewer system. Benham & Muller-gren, consult. engrs., Kansas City, Mo.

N. J., Egg Harbor City—Resolution passed for sewerage plant.

N. J., Sayreville—Bond for sewer contract was fixed at \$75,000 with an additional maintenance bond of \$20,000 for six months after completion of work.

N. Y., Boro Richmond—Ed. of Estimate & Apportionment consider constr. of sewers.

N. Y., Boro Brooklyn—Local board passes resolution to construct sewers in various streets.

N. Y., Buffalo—City council intends to construct 18 in. tile sewer in 2 sts. and four and three ft. diameter sewer in Dartmouth ave.

N. Y., Rochester—Ordinance passed to construct sewer in Avon place.

N. Y., Oswego—Plans being prepared to construct sewers in 5 streets.

N. Y., Boro Queens—City plans sewer construction.

N. Y., Syracuse—Sewer extensions are contemplated. City clerk.

N. Y., New York City—Council contemplates system of garbage disposal.

Ohio, Springfield—The city will build the Warden st. and Fostoria ave. sewers by direct labor. Edgar E. Parsons is city manager.

Ohio, Marion—Sanitary sewer ordered to be constructed in Fair Grounds.

Ohio, Salem—Sanitary sewers will be built in Green and Summit streets.

Ohio, Sandusky—Property owners protest against proposed sewer.

Ohio, Cleveland—The village of Rocky River this county will make \$200,000 in improvements this year including many sewers and the laying of water mains.

Ohio, Toledo—A bond issue of \$125,000 for motorizing the garbage collection equipment has been voted by the city council. The money will be used for the purchase of motor trucks and trailers.

Ohio, New Philadelphia—At a cost of abt. \$6,000 sanitary sewers are to be laid in Ray, Miller, Kelly and Wabash sts.

Ohio, Painesville—A delegation from Willoughby, this county, has petitioned the county comrs. for the creation of a sewer and water district from Willoughby to the Lake.

Ohio, Portsmouth—A storm and sanitary sewer will be constructed between Harrisonville and Lakeview aves. Probably 30 inches.

Ohio, Elyria—Resolution adopted for sanitary sewers in Parkview court and Garvin ave.

Ohio, Middletown—Bond issue of \$3,839 authorized for sewers.

Oklahoma, Comanche—City voted to issue \$275,000 sewer, light and water bonds.

Oklahoma, McAlester—City will improve and extend sewer system; construct two Imhoff tanks for disposal plant; cost, \$50,000.

P. I., Cumberland—It is proposed to extend sewers in Chapel and Crescent sts. About \$120,000. E. S. Nettleton, Bureau of Engineering, city engr.

P. C., Union—City will extend sewerage lines. The mayor

Tex., Rising Star—Sewer bonds to the amount of \$30,000 voted. The mayor.

Tex., Greenville—Storm sewers, costing approximately \$50,000, will be constructed in near future. The mayor.

Tex., Magnolia Park—It is planned to issue \$500,000 bonds for sewer, water works and street improvements, etc.

Tex., Alto—At a recent election an issue of sewerage system bonds to the amount of \$35,000 was authorized.

Wash., Spokane—The proposed North Side sewer in the northwest part of the city, estimated to cost \$62,500, met with strenuous opposition when brought before the City Council. The work will be held up.

Wash., Bloomington—Plans will be made soon for construction of sewer system, for which a petition has been circulated. City clerk.

W. Va., Spencer—Town voted \$40,000 bonds to build sanitary sewerage system.

Ont., Sault Ste. Marie—Council will call for bids in near future for proposed sanitary sewerage system. Estimated cost, \$52,100.

Ont., Niagara Falls—City plans to build Muddy Run sewer. About \$250,000 James Proctor & Redfern, 36 Toronto st., Toronto, engrs.

Ont., Brantford—Construction of sanitary sewer on Alonzo st. and a storm sewer on Arthur st. authorized. F. P. Adams, city engr.

Que., Montreal—City plans to build 3 3/4 miles brick sewer in Sherbrooke st. E. from Delormier ave. eastward. About \$388,938. A. E. Doucet, city mgr.

PITTSBURGH METER COMPANY

QUALIFIED BY MANY YEARS' EXPERIENCE IN METER BUILDING.—

"Arctic"—A frost-bottom meter for cold climates.

"Keystone"—An all-bronze meter for warm climates.

"Eureka"—A current meter for large and rapidly flowing volumes of water.

"Keystone Compound"—For services requiring close registration of both large and small flows.



OUR HIGHEST AIM—

is to supply, at a reasonable initial cost, a product that will register accurately and be economical to operate and maintain. Our ever-increasing business testifies to our success in that direction.

If you visited our exhibit at the American Water Works Convention, you are no doubt convinced of the superiority of our product. If you did not have an opportunity to inspect our meters there, we invite your investigation now.

May we not assist you in determining the type of meter best suited to your needs?

*Meters For Measuring Water,
Gas, Air, Oil, Gasoline
and Other Fluids*



General Office and Works, East Pittsburgh, Pa

SALES OFFICES

NEW YORK—50 Church St.

CHICAGO—5 S. Wabash Ave.

KANSAS CITY—Mutual Bldg.

COLUMBIA, S. C.—1433 Main St.

SEATTLE—Railway Exchange Bldg.

LOS ANGELES—Union Oil Bldg.

WATER SUPPLY

Colo., Siebert—City plans to sell \$50,000 bonds to build waterworks system.

Conn., Hartford—Resolution passed for additional issue of bonds for work on water supply system, \$200,000.

Fla., Miami—Miami Waterworks Co., having plans prepared for combined filtration and softener plant. About \$500,000.

Fla., Milledgeville—It has been decided to issue water bonds to the amt. of \$30,000.

Ga., Bibb City—City voted \$15,000 water supply bonds. The mayor.

Ia., Eldora—City having plans prepared improving waterworks system. Burns & McDonnell, Interstate bldg., Kansas City, Mo., engrs.

Ia., Cedar Rapids—City plans to build 2 settling basins, douglas fir on cement piers. About \$15,000.

Ia., Dubuque—City bond issue of \$50,000 proposed for sale July 5 for water system improvement.

Ill., Bellwood—City plans to construct new waterworks system. About \$167,000.

Ill., Flora—City having plans prepared extending waterworks and improving electric light and power plants. Work includes laying of water mains and adding 1 unit of power plant. About \$40,000.

Kans., Council Grove—It is planned to improve water works system. Black & Veatch, Kansas City, Mo.

Md., Frederick—City will improve water supply; construct dam, concrete and stone construction, 22 ft. long, 6 ft. above foundation. The mayor.

Mich., Grand Rapids—City Council will have survey made of west side water works.

Mich., St. Louis—City voted \$15,000 bonds to build concrete reservoir. Plans being prepared. Burd & Giffels, civil engrs., Grand Rapids.

Miss., Meridian—City will install two filters at pumping station, increasing number of eight filters, with daily capacity of 4,000,000 gallons of water.

Mo., Kirksville—A proposition to issue water bonds to the amount of \$285,000 was submitted to the voters on June 21.

Mo., Hayti—Bonds to the amount of \$30,000 will be sold for construction of water works system. Engineer not selected.

N. C., Asheville—It is planned to issue \$25,000 bonds to extend water mains. B. M. Lee, city engr.

N. C., Charlotte—City plans to expend \$200,000 for water plant improvement.

N. D., Fessenden—It was recently voted to issue \$30,000 bonds for building water tower, pumping station and full distribution system.

N. Y., Wellsville—Water & Light Com. receives bids about July 8, installing 2 300 h. p. water tube boilers and 1,000,000 gal. daily capacity rapid sand filter plant. Bonds for \$65,000 were voted for project.

N. Y., North Tonawanda—City plans to build filtration plant. About \$200,000.

N. Y., Syracuse—Bids will soon be called for construction of first six miles of new conduit to bring water from Skaneateles Lake to city. \$750,000.

N. Y., Wellsville—Election held recently to decide upon proposals for improvements to water and light system, including million-gallon rapid sand filter plant and two 300 h. p. water tube boilers. E. J. Rowe, supt.

O., Youngstown—\$5,000,000 bond issue proposed for belt line water supply, extension of mains and installing 10,000 gal. pump.

O., Elyria—The city council has passed an additional \$360,000 bond issue for completing, enlarging and improving the Elyria water works system.

O., Springfield—The city comsn. has authorized a \$100,000 bond issue for reinforcing the distributing system of the water works dept. Bids will shortly be invited.

O., Xenia—The authorities of Antioch college at Yellow Springs, this county, will construct a water works system on land recently donated to the college by George Little, manufacturer and banker of Xenia and a trustee of the college

O., Springfield—Installation of boilers at water works pumping station proposed, \$150,000.

O., Dover—Bids rejected for water line in Park and Regent sts. and will readvertise.

O., Fostoria—State Dept. of Health may order improvement of water supply.

O., Barberon—Water mains will be laid in Orchard ave., Parker ave., and 5 more sts.

O., Springfield—This city will purchase new boilers for the water works station. George Cotter is the supt. of the waterworks dept.

O., Dover—The council has passed ordinances to proceed with the construction of a water line on 12th st. from Wooster ave. to Cross st. and in parts of Race and E. 12th sts.

Okin., Comanche—City voted bond issue of \$275,000 for water, light and sewer systems.

Okl., Okmulgee—City having plans prepared improving waterworks system, including elevated reservoir, 15 mi. new mains and extensions to filters. Abt. \$400,000.

Okl., Supply—Vote to be taken soon on bond issue of \$20,000 for water wks. improvements. The mayor.

Ore., Creswell—Election will be held July 18 to vote \$18,000 bonds for impvts. to water system.

Ore., Brownsville—Brownsville is selling bonds to amount of \$15,000 for improvement of streets and \$25,000 for constructing water works.

Ore., Creswell—Special election July 18 for voters to pass upon proposal to purchase and improve present water plant and construct new one.

S. C., Fort Mill—An issue of water bonds to the amount of \$9,000 is under consideration.

S. D., Beresford—City plans to improve waterworks and power plant Abt. \$70,000. Dakota Eng. Co., Mitchell, engineers

S. D., Beresford—City authorized issuance of \$70,000 bonds to build new well at water plant, purchase engine for electric plant, etc. W. M. Yorker, clerk.

Tex., Magnolia Park—City voted \$500,000 for water works, sewer and street improvements, fire equipment, etc. The mayor.

Tex., Dallas—Water department of Oak Cliff Station plans construction 1,000,000-gal. capacity reservoir. J. B. Winder, chief engineer.

Tex., Rising Star—A recent election resulted in favor of issuing the following bonds: Water \$35,000; street, \$35,000; sewer, \$30,000.

Tex., Fort Stockton—The election held recently resulted in favor of issuing water works bonds to the amount of \$75,000.

Tex., Karnes City—An election was held June 21 to vote the issuance of water bonds to the amount of \$65,000.

Tex., Rising Star—Bond issue of \$35,000 recently voted. The mayor.

Tex., Chillicothe—City voted \$110,000 bonds to install water and sewer systems. The mayor.

Va., Norfolk—City is considering appropriating \$109,187.07 for installation of 5 miles of water mains. Walter H. Taylor, 3rd, director of public works.

Wash., Auburn—An issue of \$125,000 water system bonds was voted on; widening various streets, etc.

Wash., Spokane—Water department will immediately make a survey of water main on 21st ave., which is reported rotted beyond point of usefulness.

Wash., Creston—Bond issue of \$20,000 for new water works system carries.

Wash., Walla Walla—City sells \$500,000 water works bonds to investment bankers, providing funds for project.

Wash., Walla Walla—All bids were rejected as too high, and Ernest B. Hassay, consulting engineer of the city, authorized to prepare new plans for a reservoir to be built on the flat, with cost not to exceed \$250,000.

Wash., Seattle—Construction of a 3d municipal pipe line from Swan Lake to city and establishment of Volunteer Park distributing reservoir vigorously urged by City Engr. Dimock.

Wash., Sumner—Special election will be held in Sumner for voting bonds in the sum of \$45,000 for additions, betterments and extensions to the water supply and distributing system of the town.

W. Va., St. Albans—St. Albans Water & Light Company will construct filtration plant at an approximate cost of \$75,000. E. B. Tisdale, director of sanitary engrs., State Dept. of Health.

BRIDGES

Ala., Montgomery—Bridges will be constructed in Blount County (with fed. aid) at an estimated cost of \$23,320.

Cal., Dunbarton—Construction of auto and pedestrian bridge proposed.

Conn., New Haven—City plans to build rein.-con. and steel highway bridge over Quinnipiac river, on Forbes ave. About \$400,000. E. S. Nettleton, city engr. E. W. Wiggin, 115 Church st., cons. engr.

Fla., Jacksonville—Commission voted to construct 24-ft. bridge over Townsend rd.

Fla., Fort Pierce—Bridging Indian river contemplated at Jensen.

Fla., Jacksonville—Bids soon called for construction of bridge over McGirt's Creek, 150 ft. long, 57 yd. fill for approach.

Ida., Boise—350-ft. steel bridge will be built over Payette river.

Ind., Indianapolis—Extensive bridge program planned by State Hwy. Comm. estimated at \$1,000,000.

Ind., Indianapolis—The State Highway Dept. contemplates a \$1,000,000 to \$2,000,000 bridge building program for 1921.

Ind., Daviess Co.—The comrs meet at Washington, on July 5, to open bids on four bridges.

Ind., Indianapolis—Funds available to place approaches to sidewalks and roadways of Senate Bridge.

Kans., Larned—Pawnee Co. plans 500 ft. bridge over Arkansas river, having 10 spans of reinforced concrete girder type.

Mass., Boston—It is proposed to rebuild Saugus river bridge of concrete, \$150,000.

Mass., Westboro—The towns of Westboro and Northboro plan to build concrete arch over Assabet river.

Mich., Lansing—The Michigan State Highway Dept. is interested in securing a second-hand steel or wrought iron superstructure for a 175-ft. single-span bridge providing a clear roadway, width preferable of not less than 18 ft.

Michigan—State Highway Dept. Lansing, plans to build bridge 580,701, 100 feet long, and Bridge 580,101, 90 feet long, both Monroe co.

Mo., Boonville—Campaign stated to complete one-half million dollar fund for bridge across Missouri river. Boonville has subscribed \$346,000, Columbia \$30,400.

Mo., Kansas—Plans for new bridge across Kaw River considered.

Mont., Missoula—New \$10,000 bridge will be built across Flathead river.

N. C., Charlotte—Survey being made for bridge over Catawba river at Buster Boyd site. Steel const. with creosoted plank roadway covered with asphalt in surface.



"PIONEER"

HIGHEST QUALITY ASPHALTS

Any Melting Point. Any Ductility. Any Penetration.

"PIONEER" Expansion Joint No. 1 is specified, recommended and used by those engineers and contractors who take pride in their work, and still believe in quality.

"PIONEER"

RUBEROAD CEMENT

It's New—It's Different—It's Efficient

It sticks to concrete like molasses sticks to fingers. Repair your concrete cracks with it. Two men, a broom and shovel and hoe all the equipment required.

THE PIONEER ASPHALT CO.
LAWRENCEVILLE, ILL.

WIARD PLOWS



Contractors' Plow No. 69

This plow is intended for use with either animal power, a traction engine or road roller.

For all Road or Contractor's work—for tearing up cobblestones and macadam—it can be used as a perfect Rooter and Pavement Plow by simply removing the steel wing below the moldboard—thus making a two in one Plow for all around work.

WIARD PLOW COMPANY
BATAVIA



Compressed Stone Base for Warrenite-Bitulithic Pavement

This form of base has been thoroughly and successfully tested for many years under widely varying climatic and subsoil conditions, and has proven eminently satisfactory, including over 200 miles on the Columbia River Highway, Oregon, shown in illustration below.



COLUMBIA RIVER HIGHWAY, PORTLAND, OREGON
Warrenite-Bitulithic Surfacing over Old Macadam Sandy Road. Approach to the Columbia River Highway at Sandy River Bridge

Service & Quality

The essential features in laying of Warrenite-Bitulithic.

We furnish expert laboratory service with every pavement laid. The result is shown by the phenomenal growth of Warrenite-Bitulithic.

Insist on The Warren Way

Illustrated booklet on Compressed Stone Base furnished upon request as well as other features of Warrenite-Bitulithic

WARREN BROTHERS COMPANY

Executive Offices: 9 Cambridge St., Bowdoin Sq., Boston, Mass.

DISTRICT OFFICES:

Utica, N. Y.	Chicago, Ill.	San Francisco, Cal.
New York, N. Y.	Phoenix, Ariz.	Memphis, Tenn.
Portland, Ore.	Toronto, Ont.	Richmond, Va.
Vancouver, B. C.	Minneapolis, Minn.	Los Angeles, Cal.
St. Louis, Mo.	Washington, D. C.	Winnipeg, Man.

Neb., Omaha—Bridge collapsed over Big Cottonwood creek near Whitney, Neb.

N. J., Trenton—Bids will be readvertised for bridge and tunnel. Bonds, \$6,000,000. All bids were rejected.

N. J., Trenton—State Hwy. Comm. has passed resolution to set aside funds to pay state's share of cost of erecting the Perth Amboy bridge.

N. Y., Albany—Cohoes bridge to cost \$572,000 and completion in 15 months. Contracts will be awarded July 1.

N. Y., Buffalo—New footbridge across arm of Bunnell Pond in Beardsley Park proposed, \$10,000.

Ohio, Dayton—City plans to build 6 reinforced concrete slab bridges over Erie and Miami Canal on Main, Jefferson Warren, Stout, Apple and Stewart sts. About \$82,000. G. Baker, city engr.

Ohio, Fremont—Co. Comm. proposes to build \$250,000 bridge across Sandusky, concrete, 4474 feet long, 61 ft. wide.

Ohio, Dayton—Troy pike bridge will be repaved and repaired. \$8,500.

Ohio, Bellaire—Banks of city have bought Belmont Bridge bonds.

Oklahoma, Lawton—Several bridges carried away or damaged by river flood.

Ore., Eugene—Eugene voters at special election rejected proposal to issue \$60,000 bonds to build bridges in city and reject \$15,000 bonds for paving st. intersections.

Ore., North Bend—James H. Owen, president, California & Oregon Lumber Co., Brookings, Ore., completing cross-section of 14 miles main line railroad. Project comprises several large bridges, also minor ones and grading. Contracts will be let for whole or any part of work late in June. The project entails the expenditure of about \$500,000.

Pa., Pittsburgh—Plans will be prepared for reconstruction of Point bridge.

Pa., Gettysburg—Conewago Creek broken by big truck.

Utah, Wallsburg—Railroad bridge over Provo river collapsed.

Utah, Mt. Pleasant—Bridge washed out in eastern part of city, disturbing power and light system by excess water supply.

Vt., Brattleboro—Steel bridge 330 ft. long being built over Connecticut river, collapsed.

Wash., Seattle—Business interests will endeavor to raise \$24,500 within 10 days to help in the construction of the Benton-Franklin inter-county toll bridge over the Columbia river, near Kennewick.

Wash., Yakima—The north bridge of the Toppenish-Buena road has been closed to traffic because the high water has washed out one of the approaches.

LIGHTING AND POWER

Ala., Wauchula—A new electric light plant, ice plant and cold storage plant will be erected in this city at a cost of about \$200,000. J. G. Fancy of Fort Mead interested in project.

Ariz., Phoenix—The Southern California Edison Co. plans to develop hydroelectric energy from the Colorado River. The project will involve an expenditure of about \$100,000,000. John B. Miller of Los Angeles, is president of the Edison Company.

Ala., Fort Payne—The electric lighting plant at Fort Payne will be improved by overhauling the plant, installing new generators and other machinery. A. A. Miller, electrical engr., of Chattanooga.

Ga., Augusta—Board of Commerce considers the electrification of the canal.

Ia., Shell Rock—Franchise was granted W. M. Roe of Waverly and E. R. Smith, Chicago, Ill., to erect an electric power plant and dam at Shell Rock, Ia.

Mass., Boston—The New England Power Co. contemplates enlarging its power facilities in the western part of Massachusetts.

Neb., Lincoln—Resolution introduced asking that bids be advertised for construction of new power plant at A st., water and electric station, \$150,000.

N. Y., Boro Brooklyn—Local Board considers contract of Murphy Bros. for restoration of gas mains along route 22.

N. Y., Binghamton—Board of Estimate and Apportionment approved an ordinance providing for the construction of an ornamental lighting system on Water street.

N. Y., Hamilton—City Council appropriated \$5,000 for employment of engineer to make preliminary survey of municipal lighting plant.

N. Y., Hamilton—This city plans the construction of a \$650,000 elec. light plant.

Ohio, Middletown—The city coms. will initiate legislation to comply with recommendations of the Chamber of Commerce for ornamental lighting on various street, sidewalk widening, removal of overhead wires and unsightly poles, redistricting city and condemnation of property between M. & E. canal, and Clinton, Second and 3d sts.

Oklahoma, Sayre—Election held June 15 to vote electric light bonds, \$40,000.

Tex., Dallas—The Dallas Gas Co. contemplates extensive improvement which calls for a bond issue of \$2,500,000.

FIRE EQUIPMENT

Ala., Birmingham—\$3,200 fire dept. bonds to be purchased, 5 per cent.

Conn., Hartford—\$120,000 appropriation available for proposed site for Fire House.

Conn., Stratford—Purchase of triple combination motor apparatus is under consideration.

Ind., Terre Haute—Two new combination hose and chemical fire trucks will be bought by the board of public safety. The city council has appropriated \$9,000 for the purpose.

Ind., Indianapolis—Board of public safety issued orders changing system for receiving and handling fire alarms and system under which motor pumbers are operated.

Ky., Covington—A fire at Burlington, Ky., county seat of Boone county, did \$30,000 in damages and threatened to wipe out the place. Cincinnati firemen responded to an appeal for help and found nothing but cisterns for a water supply. A dozen of these were drained before the fire got under control.

Mich., Detroit—Oakwood village near here suffered a \$25,000 fire loss. The place has no fire protection. In this case the telephone wires were at once burned and it was a long time before the Detroit fire department could be reached.

N. Y., Buffalo—John F. Malone, comr. of parks and public buildings closes bids today for remodeling police station No. 1 at Franklin and W. Seneca st.

Ohio, Middletown—Fire dept. is in need of new and modern fire equipment.

Pa., Struthers—City council has ordered that a pressure pump be purchased for testing old and new hose.

Ohio, Ravenna—Safety director recommends installation of new fire alarm system.

Ohio, Findlay—Inability to sell six per cent bonds has caused the council to postpone till next year the motorization of the Findlay fire department.

Pa., Struthers—The council has authorized the purchase of a pressure pump for testing new hose and making a test of old hose. Mr. Ditmar is the fire chf.

Ohio, Toledo—A two-story stucco garage and servants quarters at the country home of W. E. Bock, Eagle Point Co-

ony, near Rossford, has been burned to the ground with \$25,000 loss. Firemen from No. 10 engine house East Side laid 1,200 ft. of hose but were unable to reach the flames.

Ohio, Toledo—The council has authorized a \$125,000 bond issue to motorize a portion of the division of streets equipment including that used in garbage collection. Among the larger vehicles to be purchased will be a caterpillar type tractor, 6 one-ton trucks, 4 roadsters, 4 tractor dump trucks and 30 garbage collection trailers.

Pa., Bellefonte—Funds have been raised for purchase of new fire apparatus.

Tex., Dallas—Additional motor apparatus for fire department may be provided in annual budget now being considered by the board of commissioners. Chief Myers recommends that the six pieces of motor apparatus now being used be replaced as they are no longer fit for service.

MISCELLANEOUS

Cal., Sacramento—Governor signed Senate Bill No. 955, appropriating \$20,000 toward survey of the feasibility of taking water from the Klamath river for irrigation of lands in the Shasta Valley in Siskiyou county.

Cal., San Francisco—Tooeel Irrigation project being considered containing 65,000 acres, by Water Storage Assn.

Conn., Hartford—Common Council appoints committee to prepare plans for comfort station, \$30,000.

Ill., Chicago—Plans in progress involving expenditure of \$3,500,000 for bathing beach, park blvd., quays, etc.

Ill., Decatur—Clearing land for proposed reservoir will cost \$100,000.

Ind., Indianapolis—\$200,000 will be spent for development of playgrounds; \$98,000 for golf course; \$175,000 for swimming pools.

Mo., Kansas City—Park Board rejects petition to condemn property for public playground.

N. Y., Boro Richmond—Local board plans improvement of Clove Lakes Park.

N. Y., Boro Manhattan—Appropriation of \$225,000 requested to construct station extension at 149th st. Rapid Transit R. R.

N. Y., Jamaica Bay—\$750,000 appropriation made for building bulkhead, platforms and dredging channel at Mill Basin.

Ohio, Canton—Service director Smith is authorized to advertise for bids for dredging and straightening East Creek. The city has recently sold \$214,000 of the bonds.

Ohio, Chillicothe—Contracts will be let at once for tearing down wooden walls along Worthington run and replacing them with concrete. The Utilities dept. at Camp Sherman has received an order to do this work at a cost of \$7,622.

Ohio, Bellefontaine—The counties of Logan, Auglaize and Shelby are considering jointly dredging the Miami river and Muschinnipi creek at an expense of \$200,000. The removal of a mill dam in the Miami at Quincy is involved.

Tex., Clarksville—Has authorized an issue of \$80,000 6 per cent 30 year Levee bonds dated May 1, 1921.

Wash., Seattle—A survey of the Lake Washington canal system with a view of widening and deepening the canal to permit passage of vessels of greater size.

Wash., Manson—Additions and extensions to the irrigating system, which will probably involve an outlay of \$250,000 when completed are under way.

Washington—Purchase by government of Cape Cod canal for \$11,500,000 recommended to Congress.

Mex., Mexico City—Naval building program calling for an expenditure of a sum of \$100,000,000, covering a period of 10 years, has been outlined by the Department of Army and Navy.

For Garbage Collection

H
E
I
L

B
O
D
I
E
S



H
Y
D
R
O

H
O
I
S
T
S

This three-yard welded steel garbage body is one of several used by the city of Madison, Wisconsin. It is fitted with six covers, steps for loading, and a special water-tight tail gate. The body is raised and dumped with a Heil Hydro Hoist, which allows the use of all the loading space back of the cab.

We will be pleased to consult with you regarding your requirements.

THE HEIL CO.

1132-50 Montana Ave., Milwaukee, Wis.
Welded Storage Tanks—All Kinds and Capacities



GRAVEL SCREENING PLANT

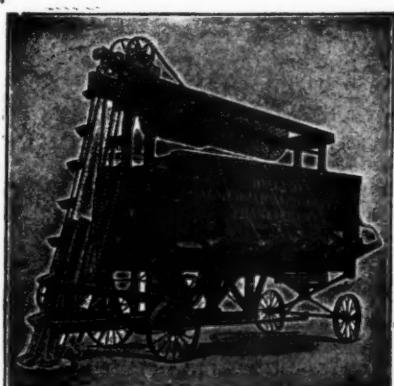
This type of screener has proven its efficiency in point of economy, power and saving in labor. Requires a few minutes only for one man to put in or take out of operation.

Continuous bucket loading elevator. This plant can be used for unloading stone, gravel, sand or coal, simply by removing screen.

Indispensable for road contractors, who value time in loading.

We also manufacture brushes, screens, bins, elevators, graders, road rollers, unloading plants, etc. Catalog showing full line on request.

ACME ROAD MACHINERY CO.
FRANKFORT, N. Y.



SAVES
POWER and
LABOR

TRADE MARK REGISTERED

KOPPEL

U.S. PATENT OFFICE

On Every Big Job!

KOPPEL cars of various types are used by practically all large contractors.

We carry at all times a complete stock of cars, dinkeys, track, switches, etc., ready for prompt shipment.

An attractive rental proposition is offered to you also.

KOPPEL INDUSTRIAL CAR AND EQUIPMENT COMPANY

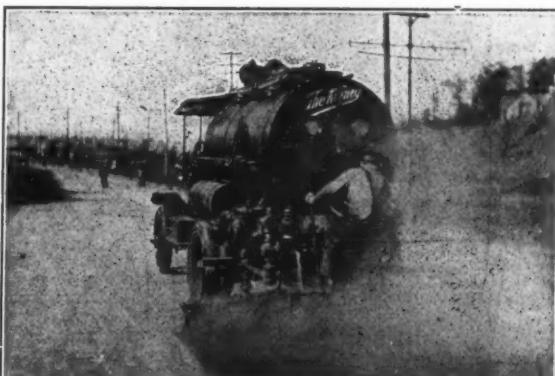
Koppel, Penna.

Sales Offices:

New York City
Chicago
Pittsburgh

Philadelphia
San Francisco
Detroit

QUALITY
Kinney
EFFICIENCY



Asphalt and Tar Sprayer

The Standard of Efficiency and Economy
Get Our Complete Catalogue

Kinney Manufacturing Co.
Boston, Mass.

NEW YORK
KANSAS CITY

CHICAGO
HOUSTON

SAN FRANCISCO
PHILADELPHIA

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

WORK CONTEMPLATED

STREETS AND ROADS

Ill., Chicago 11 a. m., June 27
For paving certain streets.—Michael J. Faherty, pres., Board Local Impvs.

Ill., Chicago 11 a. m., June 28
For street improvement.—Michael J. Faherty, pres., Board Local Impvs.

Ind., Brazil 10.30 a. m., July 14
For G. M. Rogers et al, John Leslie and O. B. Shalev rds.—Wiley E. Partrish, Clay Co. aud.

Ind., Martinsville 2 p. m., July 6
For J. J. Hase rd.—H. H. Nutter, Morgan co. aud.

Ind., Miami Co. noon, July 6
For grading, paving, etc., on Aaron Michael and E. L. Coppock rds.—Chas. Wolf, co. aud.

Ind., Rockingham 8 p. m., June 27
For sidewalks and alley crossings.—J. J. Becker, town clk.

Minn., Duluth 11 a. m., June 27
For improvement of alleys—F. D. Ash, city clk.

N. J., Montclair 4 p. m., June 30
For concrete curbs on Oxford st.—Harry Trippett, town clk.

N. Y., Albany noon, July 13
For improving and repairing highways in various counties.—Herbert S. Sisson, comr. hwys.

Utah, Salt Lake City 10 a. m., July 5
For grading and constructing curb, gutter and pavement.—W. A. Leatham, city recorder.

Wash., Mt. Vernon July 3
For concrete Pacific Hwy. through Burlington.—Co. Comrs.

SEWERAGE AND SANITATION

Ill., Chicago 11 a. m., June 27
For sewers.—Michael J. Faherty, pres. Bd. Local Impvs.

Ill., Chicago 11 a. m., June 28
For sewers.—Michael J. Faherty, pres. Bd. Local Impvs.

WATER SUPPLY

N. J., East Orange 8 p. m., June 27
For laying water mains.—R. M. Roper, engr., 436 Main st.

Okla., Dover June 28
For extension of water lines.—Board Control.

LIGHTING AND POWER

N. J., East Orange 8 p. m., June 27
For street lighting.—Lincoln E. Rowley, city clk.

Okla., Dover June 28
For replacement of equipment of city light plant.—Board Control.

BRIDGES

N. J., Mount Holly 9.45 a. m., July 1
For bridge spanning Assiscunk crk.—Alfonza Adams, clk., Board Chosen Freeholders

Okla., Cincinnati noon, July 1
For concrete floor for Bridge No. 9, Zion Hill road.—A. E. Mittendorf, pres. Co. Comrs.

MISCELLANEOUS

N. J., Elizabeth 3 p. m., June 28
For road roller.—Herman Kling, co. supvr. roads.

N. J., Mt. Holly 10 a. m., July 1
For Cletrac tractor.—Alfonza Adams, clk., Board Chosen Freeholders.

STREETS AND ROADS

Cal., San Francisco—\$20,000,000 will be spent on state highway and post rds. by Federal Government along Pacific coast.

Conn., Hartford—Common council plans to extend Dexter st. also new curbs in other sts.

Fla., Palatka—\$30,000 will be expended on 40 blocks of streets, vtr. brk.

Ind., Lehigh—Good Roads Comm held meeting to consider plans for Scenic Highway along Des Moines river, thru Dolliver Memorial Park, connecting Ft. Dodge and Lehigh.

Ind., Clinton—Petition circulated for oiling various sts. F. W. Leedham, city clk.

Ind., Davenport—City will construct sidewalks and crossings by day work.

Ky., Pineville—Immediate construction of Dixie Highway in Bell Co. planned, \$100,000 appropriated.

Kentucky—Northern Kentucky Good Roads Association plan to issue \$500,000 bond issue at coming election. Fed. Aid \$500,000

La., Amite—\$325,000 Good Road bonds adopted for road district 1, ward 7, to build 31 miles of model road near Ponchatoula.

Minn., Red Lake Falls—City council will construct cement sidewalk and st. and alley crossings, various sts.

Minn., Mankato—Blue Earth co. will consider bids for gravel loader.

Minn., Duluth—Will call for bids soon for paving 12th ave., estimate, \$3,229.

Minn., Duluth—Will call for bids soon for paving Michigan ave. from Grand ave. to Wicklow street, concrete, \$12,057.

Minn., New Ulm—City making plans for grading various streets this year.

Mich., Ironwood—Street to Hurley to be paved with brick, concrete or tar macadam.

Minn., St. Paul—State plans to improve over 200 miles of roads and 5 bridges to be constructed.

N. C., Salisbury—\$500,000 voted for municipal purposes.

N. C., Gastonia—Co. Comrs plan to improve three roads this summer. Bond issue of \$800,000.

Neb., Fremont—City council petitioned for new boulevard, from Fremont Country Club to Broad street, about 23 feet wide, to be continuation of Lincoln highway. F. G. Pierce, city clk.

N. Y., Albany—Ordinance passed to pave and sewer Wendell alley.

N. C., Winston-Salem—Highway Com. planning immediate construction of 482 miles of roads at cost of \$7,000,000.

N. Y., Middletown—Ordinances passed to pave five streets and construction of sewers.

N. Y., Rome—One bid received on \$13,000 bond issue for paving and drainage.

Okla., Columbus—City council passes resolution to improve various streets and alleys by paving, brick or concrete, and laying water and sewer connections.

Okla., New Lexington—Crooksville road, 3-4 mile, to be paved with Kentucky asphalt, \$165,000.

Okla., Fostoria—Co. plans straightening and narrowing of Big Spring twp.

Okla., Middletown—Pike to be resurfaced at \$140,000.

Okla., Lisbon—Three streets to be paved with brick block on concrete base, also 1-2 mile Brighton road.

S. C., Fort Mill—County will construct clay road or more permanent form road from Kimballs to South Carolina line, also road from Fort Mill to North Carolina line; \$75,000 voted for roads.

Tex., Denison—\$600,000 appropriation available for paving streets.

Tex., Galveston—City proposes paving 25th st.

Tex., Cleburne—\$1,000,000 worth of road work to be awarded soon. Two rd. projects planned.

Wash., Seattle—City council passes resolution to improve various streets.

Wis., Superior—Contracts will soon be awarded on several minor road jobs.

SEWERAGE AND SANITATION

Fla., Inverness—The J. B. McCrary Engineering So., Atlanta, Ga., has made survey for proposed sewerage system and will submit plans soon. The mayor.

Okla., Dalton—City plans to extend the sewers on Morris and Green sts.

Minn., Breckinridge—Resolution was adopted directing sewer main on 7th st.

Minn., Duluth—Sanitary sewer ordered constructed, \$1,600.

Neb., Benkelman—Sewerage system contemplated. Engrs. Royal D. Salisbury Co., Denver, authorized to make tentative plans.

Okla., Toledo—Ordinance passed to proceed with construction of sanitary sewer No. 1349.

Okla., McAlester—Construction of additions to sewerage system planned.

Okla., New Philadelphia—City council has enacted legislation for sanitary sewers in Ray, Miller, Kelley, Wabash and Union sts., \$6,000.

WATER SUPPLY

Fla., Inverness—The J. B. McCrary Engineering Corporation, Atlanta, Ga., has made survey for proposed water works system and will soon submit the plans. The mayor.

Fla., Jacksonville—City is considering buying and improving water works system in Riverdale Heights. John W. Martin, mayor.

Fla., Palatka—City is proceeding with plans to acquire water works plant and consolidate with municipal system; purchase price, \$85,000; \$45,000 will be expended in consolidating the plants and installing new mains. The mayor.

Okla., Helen—City will offer \$30,000 of water works bonds for sale. W. R. Ault, town clerk.

Okla., Red Wing—At special meeting, Water board decided to purchase 6 and 8-in. cast iron pipe for water mains. Also 4 hydrants and necessary fittings.

Okla., Poplar Bluff—\$47,000 bond issue was carried to be used for purchasing water mains, motor fire apparatus and bridge repairs.

Okla., Steele—Plans in progress for water works system for fire protection, includes fresh water well, etc. \$33,000.

Okla., Beatrice—Will drill 4 test wells for additional water supply.

Okla., Albion—Will probably call for bids for constructing extension to water mains in Water Main Ext. Dist. 7.

Okla., Dunbar—Will construct well, and install water system later.

Okla., Grand Island—Ordinance passed creating Water Main District 6.

Okla., Holdredge—Water Main Dist. 6 created. Start work on extend mains soon. W. Lindstrom, city clk.

Okla., Seneca—Ordinance passed creating Water Works System in city. Con-

JUNE, 25, 1921

PUBLIC WORKS

25

THE BUFFALO-SPRINGFIELD PRESSURE SCARIFIER



can be attached in the field to a macadam roller already in service. New Buffalo Pitts and Kelley Springfield rollers can be equipped with pressure scarifiers when so ordered. Unequalled for efficiency and economy.

Buffalo Springfield Roller Company, Springfield, Ohio
MANUFACTURERS

Mechanical Filtration Plants

for

Municipal and Industrial Purposes

also

THE "HOLYOKE"
FIRE HYDRANT

Norwood Engineering Company

FLORENCE

MASS.

VITRIFIED CLAY PIPE



A Service Tested Wire Rope

The use of HERCULES (Red-Strand) Wire Rope on heavy duty equipment is not an experiment, for its many years of actual service have demonstrated that it is a safe and economical rope for such conditions. Its one red-strand is our guarantee of constant quality.

Established 1857

A. LESCHEN &
SONS ROPE CO.

St. Louis, Mo

New York, Chicago,
Denver, San Fran-
cisco



When You Need It

Highest grade that the art in the industry can produce.

Our plants are so located and the production so large that we can guarantee satisfactory service.

Our line also includes—

Wall Coping—Flue Lining—Stove Pipe
Building Blocks—Paving Brick—Drain Tile
Fire Clay—other Clay Products.

Before placing your order, write us.

THE DELAWARE CLAY PRODUCTS CO.

611-614C Arrott Building Pittsburgh, Pa.

A Meter Well Bought Is Not Half Set

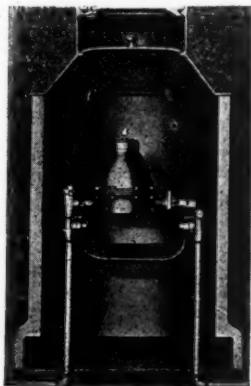
We believe that the curb is the only logical place for a water meter, for the following reasons:

- A.—Meter is safe from frost damage.
- B.—Meter is safe from tampering.
- C.—All water entering property is registered and leaks on inside piping will be promptly repaired.
- D.—Meter is less liable to damage from hot water backing up from range boiler when located at curb.
- E.—Ordinary curb box and curb stop may be done away with if desired.

There are a lot of other reasons, and meter boxes are cheap. Write us.

FORD METER BOX CO.

Wabash, Indiana



OFFICIAL ADVERTISING

EQUIPMENT BARGAINS

HIGHWAY WORK

OFFICE OF THE STATE COMMISSION OF HIGHWAYS, ALBANY, N. Y.

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster street, Albany, N. Y., at one o'clock p. m., advanced standard time which is twelve o'clock noon eastern standard time, on Wednesday, the 6th day of July, 1921, for the improvement of highways in the following counties: Cayuga (approx. 5.39) Hamilton, one completion (two highways: 3.02 and 6.72) Livingston (approx. 2.16) Monroe (approx. 3.69) Niagara (approx. 2.49) Rockland (approx. 3.85) Steuben (3 hwys.: 3.95, 1.73, 0.26) Warren (approx. 0.05) Washington (approx. 2.33) Yates (approx. 1.70)

Also for the Repair of Highways in the Following Counties—Reconstruction

Clinton (one contract) Monroe (one contract) Otsego (one contract) Steuben (one contract)

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany N. Y., and also at the offices of the division engineers in whose division the roads are to be improved or repaired. The addresses of the division engineers and the counties in which they are in charge will be furnished on request.

The especial attention of bidders is called to "General Information for Bidders" in the itemized proposal, specifications and contract agreement.

HERBERT S. SISSON, Commissioner.

J. C. FINCH, Acting Secretary.

(25-26-27)

HIGHWAY WORK

OFFICE OF THE STATE COMMISSION OF HIGHWAYS, ALBANY, N. Y.

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster street, Albany, N. Y., at one o'clock p. m., advanced standard time which is twelve o'clock noon eastern standard time, on Wednesday, the 13th day of July, 1921, for the improvement of highways in the following counties: Chautauqua (2 hwys.: 1.32 & 2.94) Cortland (approx. 3.67) Delaware (approx. 4.98) Greene (2 hwys.: 4.13 & 3.98) Ontario (2 hwys.: 3.20 & 8.81) Rensselaer (2 hwys.: 1.95 & 5.46) St. Lawrence (2 hwys.: 5.74 & 6.45) Seneca (approx. 3.20) Steuben (2 hwys.: 4.03 & 2.85) Yates (approx. 8.81)

Also for the Repair of Highways in the Following Counties

RECONSTRUCTION

Erie (one contract) Genesee (one contract) Jefferson (one contract) Westchester (one contract)

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commiss-

sion in Albany, N. Y., and also at the offices of the division engineers in whose division the roads are to be improved or repaired. The addresses of the division engineers and the counties in which they are in charge will be furnished on request.

The especial attention of bidders is called to "Special Information for Bidders" in the itemized proposal specifications and contract agreement.

HERBERT S. SISSON, Commissioner.

J. C. FINCH, Acting Secretary.

(26-27-28)

PROPOSAL

Sealed proposals will be received by the Town Council of the Borough of Somerset until 2.00 p. m., Tuesday, July 5, 1921. For the grading, paving and curbing of East Catharine street from North Main Cross street to North East street in the Borough of Somerset, Pa. Plans and specifications can be seen at the office of the undersigned, in the Municipal bldg., or Fluck & Moore Borough Engineers, Somerset, Pa. A certified check for \$500 must accompany each bid, and successful bidder must give bond in the sum of \$2,000. All bids to be sealed and marked "Bids for paving East Catharine St." and addressed or delivered to the undersigned or Fluck & Moore, Borough Engineers, Somerset, Pa. No bids will be received after the expiration of the above time, and Council reserves the right to reject any or all bids. The above paving is to be of concrete and will require approximately 1,650 yards of material.

C. E. PILE, Secy.

(26)

sists of plant and apparatus, fixtures & machinery.

Neb., **Valentine**—Contemp'ate installing municipal gravity water system here. J. H. Quigley, mayor.

O., **Cleveland**—Plans for furnishing a gravity supply of drinking water for Cleveland, Akron, Kent, Youngstown and Warren are being revised.

Tex., **Big Spring**—\$65,000 bond issue for improvement of city water works has been purchased.

Tex., **Terrell**—City comm. decides to have new water standpipe erected. \$250,000.

Tx., **Breckenridge**—Building \$1000,000 water supply works.

BRIDGES

Fla., **Tampa**—New bridge planned. Call to Platt St. site suggested.

Mass., **Lynn**—Bridge destroyed by fire will be closed all summer.

N. D., **Bismarck**—200 feet of temporary bridge over Missouri river used in construction of new vehicular bridge gave way.

Mich., **Grand Rapids**—New bridge to be constructed at Pearl st.

Okl., **Muskogee**—County issued \$400,000 bonds for bridges. Federal government will match bonds.

S. C., **Union**—City will extend sewer lines. The Mayor.

Wrought Pipe Rethreaded

For your new road contract you will want pipe for your water service. Our used pipe, rethreaded and coupled, will answer your requirements the same as new pipe and will save you considerable money. We carry all sizes from $\frac{3}{4}$ to 12 inches, have large stock, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 2, 2 $\frac{1}{2}$, 3 and 4 inches.

Marine Metal & Supply Co.

167 South St., N. Y. City
137-147 Fifteenth St., Jersey City

Contractors Equipment

Concrete Mixers, Road Rollers, Steel Piling, Pipe, Locomotives, Cars, Rails, Track Accessories, Tanks, Pumps, Boilers, Engines Motors, Crushers and Steam Shovels.

ZELNICKER IN ST. LOUIS

Have You Received YOUR Copy Bulletin 290?

LIGHTING AND POWER

In., **Iowa Falls**—Plans in progress for building electric light plant, \$150,000. Will hold meeting to hold bond issue.

Minn., **Redwood Falls**—Will install white way; \$8,000 bonds voted. \$14,000.

Minn., **Mankato**—Site purchased at W. Front and Moreland ave. for erection of transformer. Owner, Northern States Power Co., Minneapolis, Minn.

Minn., **Duluth**—City comrs. ordered Duluth Edison Electric Co. to install cluster lights, ornamental type, on 12 sts.

Minn., **Duluth**—Considering purchase additional elec.-driven pump at Lakewood pumping station.

N. D., **New England**—Extension or white way on Main st. ordered.

Neb., **Ogallala**—City installing elec. pumping system. Care city clk.

N. D., **Verona**—Contemplate erecting electric light plant. Care city clk.

S. D., **Watertown**—Letting postponed to June, on contract for additional power plant equipment in municipal plant.

S. D., **Beresford**—City will purchase new engine for municipal electric light plant. Care city clerk.

Wis., **Wausau**—Annual meeting held executive comm. and mgr. instructed to proceed with construction of reservoir and dam at Spirit river. Owner, Wisconsin Valley Impvt. Co. \$100,000.

Wis., **Kenosha**—Will submit petition for ornamental lighting system on Main st and Milwaukee ave. to council meeting.

MISCELLANEOUS

Ia., **Boone**—Plans made for Drain 172. Civil engr., Hugh A. Chambers, Boone.

FILTERS

Hypochlorite Apparatus and Water Softening Plants

The New York Continental-Jewell Filtration Company

General Offices and Works: NUTLEY, N. J.
111 West Monroe St., CHICAGO New Barks Bldg., MONTREAL

Liquid Chlorine

Electro Bleaching Gas Co.
PIONEER MANUFACTURERS OF LIQUID CHLORINE

Plant NIAGARA FALLS, N.Y.
Main office 18 East 41st Street New York. Chicago office 11 So. La Salle St.



Ia., Rockwell City—Will construct Drainage District 16-31, in Johnson and Fulton twps. Webster co., and Lincoln and Greenfield twps., in Calhoun co.

Ia., Marshalltown—Will report on extension of Hardin co. Drainage Dist. 121 as Joint District.

Minn., Redwood Falls—Redwood co. Hearing on Ditch 64 postponed till Jan. 4, 10 a. m., 1922.

Mont., Hamilton—Will repair ditches of Bitter Root Irrigation system.

Miss., Yazoo City—Yazoo County Supervisors are considering constructing levee to protect territory between Piney creek and Yazoo City from flood waters, will make survey to determine cost.

Miss., Cleveland—Central Drainage District Comrs. Bolivar co., will construct canals and ditches. W. W. Boone, engr.

Miss., Batesville—Extension of Yocona-Tallahatchie Drainage District to Greenwood, Miss., permitted by Chancellor J. G. McGowan; will drain surplus water of Mississippi delta north of

Greenwood. Cost of proposed system, \$6,500,000. J. W. McCarty, Vance, Miss. appointed comr. for the district.

Neb., Whitney—Irrigation District nr. here being projected, water 12,000 acres land.

Neb., North Platte—Lincoln county. Survey made for Drainage District 1. Bonds sold. A. S. Allen, city clk.

S. D., Volin—Yankton co. Meeting held co. comrs. to decide matter of extending Volin lateral D. D. 1 Jesse D. McCoun, co. aud.

Expert Information by Experienced, Practical Men

FREE ASSISTANCE TO OUR READERS

PUBLIC WORKS receives many requests daily from its subscribers and advertisers. Some of them want help on work that is new and unusual. Others want information concerning machinery, tools, equipment, supplies. They ask us to recommend what is best suited for the purpose and to tell them where to buy

it. This service is promptly and freely given. PUBLIC WORKS has a competent staff of practical engineers in its exclusive employ who will answer your requests. Our facilities for gathering and furnishing information are unequalled by any publishing company in the public engineering and contracting field.

Address Information Bureau

PUBLIC WORKS
243 West 39th Street, New York

NEW YORK'S TRIBUTE

TO AMERICAN-LA FRANCE PERFORMANCE

New York City first purchased American-LaFrance Motor Fire Apparatus in 1912. In 1917 an order was received for 25 Pumping Cars, in 1918 an order for 15 more Pumpers of the same type. In 1920, 21 pumper, and 1921 brought the crowning tribute to the performance of this enormous fleet with a new order for 20 more Pumping Cars.

Each car delivered has undergone a rigid road test, and a twelve-hour pumping test. This is a record without parallel and one that can never be surpassed. 143 pieces of motor apparatus, including 81 Pumping Cars, in our largest city, furnish a convincing testimonial to the unapproachable position occupied by American-LaFrance Motor Fire Apparatus.

AMERICAN-LA FRANCE FIRE ENGINE COMPANY, INC.

ELMIRA, N. Y.

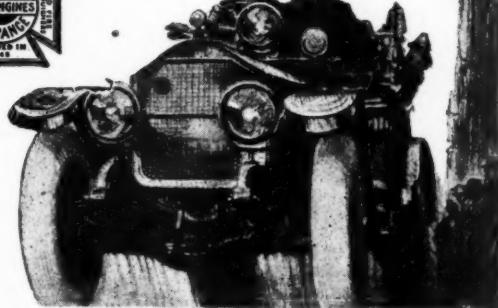
New York
Pittsburgh
Dallas

Boston
Chicago
Los Angeles

Washington
Minneapolis
San Francisco

Atlanta
Denver
Portland

Canadian Factory—Toronto, Ont.



*Signs of
DISTINCTION*

Good street and traffic signs are as important as good streets and efficient lighting. You don't want lights that will not illuminate properly at night, neither do you want signs that will not guide right during the day.

"ING-RICH"
PORCELAIN ENAMELED IRON
SIGNS

never rust, fade or discolor. They are made of mineral porcelain and iron united by special process, into one substance extremely durable. The worst weather you ever saw will not affect them. They are guaranteed for ten years.

Drop us a line of inquiry. No obligation.

Ingram-Richardson
Manufacturing Company
Beaver Falls, Pa.

BUYERS' CLASSIFIED DIRECTORY

of Names of Firms from Whom to Buy Material, Appliances and Machinery Needed by Public Works Departments and Contractors

CONTRACTORS'

EQUIPMENT

(See Paving Machinery also)

Aerial Tramways

Leachen & Sons Rope Co.

Asphalt Block Press

Nat'l Moulding Press Corp.

Air Compressors

Sullivan Mchly. Co.

Ash Handling Machinery

Blaw-Knox Co.

Asphalt Block Press

Nat'l Moulding Press Corp.

Backfillers

Pawling & Harnischfeger Co.

Bar Benders

Koehring Mch. Co.

Barges

American Bridge Co.

Blasting Powder

Du Pont de Nemours Co.

Braces, Trench

The Duff Mfg. Co.

Bridges

American Bridge Co.

Blaw-Knox Co.

Bridge & Wharf Timbers (Creosoted)

Wyckoff Pipe&Creo. Co., Inc.

Buckets, Automatic & Dumping

Blaw-Knox Co.

Hayward Co.

Buckets, Clam Shell, Dragline, Orange Peel

Blaw-Knox Co.

Brown Hoisting Mchry. Co.

Hayward Co.

Cableways

Flory Mfg. Co.

Cars, Dumping and Industrial

Good Rds. Mchly. Co., Inc.

Koppel Industrial Car & Equipment Co.

W. A. Zelnicker Supply Co.

Carts, Concrete

Acme Road Mchly. Co.

E. D. Etnyre Co.

Castings

American Bridge Co.

U. S. Cast Iron Pipe & Foundry Co.

Caterpillar Tractors

Holt Mfg. Co., Inc.

Chutes, Coal

U. S. Cast Iron Pipe & Foundry Co.

Conduits (Creosoted)

Wyckoff Pipe&Creo. Co., Inc.

Cranes, Locomotive

Brown Hoisting Mchry. Co.

Orton & Steinbrenner

Cranes and Hoists

Brown Hoisting Mchry. Co.

S. Flory Mfg. Co.

Cross-Arms (Creosoted)

Wyckoff Pipe&Creo. Co., Inc.

Cross-Ties (Creosoted)

Wyckoff Pipe&Creo. Co., Inc.

Crushers

Acme Road Mchly. Co.

Good Rds. Mchly. Co., Inc.

Gruendler Patent Crusher & Pulverizer Co.

Universal Road Mchly. Co.

W. A. Zelnicker Supply Co.

Derricks

American Bridge Co.

Dinkeys

Koppel Industrial Car & Equipment Co.

Ditchers and Graders

Owensboro Ditcher and Grader Co.

Drills

Sullivan Mchly. Co.

Dump Bodies, Steel

Mandt Body Co.

Providence Body Co.

Dump Wagons

Acme Road Mach. Co.

Austin-Western Road Mchly. Co.

Good Rds. Mchly. Co., Inc.

Standard Steel Wks.

Tiffin Wagon Co.

Engines

Flory Mfg. Co.

Excavators

Blaw-Knox Co.

The Baker Mfg. Co.

Hayward Co.

Pawling & Harnischfeger Co.

Explosives

E. I. du Pont de Nemours & Co.

Jacks, Lifting

The Duff Mfg. Co.

Lumber

E. J. Sterner Lumber Co.

Lumber (Creosoted)

Wyckoff Pipe&Creo. Co., Inc.

Mixers

Acme Road Mchly. Co.

Blaw-Knox Co.

Motor Trucks

Tiffin Wagon Co.

Paint

Dixon Crucible Co., Jos.

Piles (Creosoted)

Wyckoff Pipe&Creo. Co., Inc.

Piling, Sheet Steel

W. A. Zelnicker Supply Co.

Plows

Wiard Plow Co.

Stand Pipes

Jas. McNeil & Bro. Co.

Poles (Creosoted)

Wyckoff Pipe&Creo. Co., Inc.

Pumps

Acme Road Mchly. Co.

Emerson Pump & Valve Co.

Rails

W. A. Zelnicker Supply Co.

Snow Removal Outfits

The Baker Mfg. Co.

Holt Mfg. Co., Inc.

Structural Steel

American Bridge Co.

Switches

Koppel Industrial Car & Equipment Co.

Tackle Blocks

Atlantic Equipment Co.

Track

Koppel Industrial Car & Equipment Co.

Trailers

Smith & Sons Mfg. Co.

Turn Buckles

American Bridge Co.

Turn Tables

American Bridge Co.

Wire Rope

Leschen & Sons Rope Co.

Danger Signals

Ingram-Richardson Manufacturing Co.

FIRE DEPARTMENT EQUIPMENT

Combination Chemical and Hose Wagons

American-La France Fire Engine Co.

Fire Alarm System

Loper Fire Alarm Co.

Pumping Engines, Gasoline

American-La France Fire Engine Co.

Triple Combination Motor

American-La France Fire Engine Co.

PAVING AND ROAD MACHINERY

Asphalt Block Press

Nat'l Moulding Press Corp.

Asphalt Plants

Asphalt Pavement Retreading Co.

Cummer & Son Co.

Hetherington & Berner

Warren Bros. Co.

Car Loaders

Acme Road Mchly. Co.

Good Rds. Mchly. Co., Inc.

Universal Road Machinery Co.

Concrete Mixers

Acme Road Mchly. Co.

Erie Mch. Shops

Good Rds. Mchly. Co., Inc.

Jaeger Mch. Co., The

Koehring Machine Co.

W. A. Zelnicker Supply Co.

Oil Distributors & Sprayers

Acme Road Mach. Co.

Austin-Western Road Machinery Co.

E. D. Etnyre Co.

Good Rds. Mchly. Co., Inc.

The Kinney Mfg. Co.

Universal Road Mchly. Co.

Road Graders

Acme Road Mchly. Co.

Austin-Western Rd. Mchly. Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Stockland Road Mach. Co.

Road Drags

Acme Road Mchly. Co.

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Levellers

Holt Mfg. Co., Inc.

Road Maintainers

Asphalt Pavement Retreading Co.

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Rollers

Acme Road Mchly. Co.

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Scalers

Acme Road Mach. Co.

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Scrubbers

Acme Road Mach. Co.

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Sweepers

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Sprayers

Acme Road Mach. Co.

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Tenders

Acme Road Mach. Co.

Austin-Western Road Machinery Co.

The Baker Mfg. Co.

Good Rds. Mchly. Co., Inc.

Holt Mfg. Co., Inc.

Koehring Machine Co.

Stockland Road Mach. Co.

Road Washers

Acme Road Mach. Co.

Austin-Western Road Machinery

WATER WORKS EQUIPMENT

L A M B E R T

DISC METERS

For Big Buildings

LAMBERT METERS

are being installed more and more every day in every big hotel and office building in the country. It's because they are built to give long satisfactory service under exacting conditions that makes them so popular. Let us send you our bulletin telling the whole story.

THOMSON METER CO.

100-110 Bridge Street Brooklyn, N. Y.

Manufacturers of

CAST IRON PIPE

BELL AND SPIGOT

FOR—WATER—GAS—CULVERTS—SEWERS
Also Flexible Joint Pipe—Cylinders—Tubes, Milled and Plain Ends—High Pressure Fire Service Pipe—Special Castings
Flanged Castings a Specialty
Quality and Service Guaranteed

FLANGED PIPE

Warren Foundry & Machine Company
Offices, 11 Broadway, N. Y. 201 Devonshire St., Boston, Mass.
Works, Phillipsburg, N. J.

Valve Inserting Machine

With this machine you can insert new valves in existing lines under pressure avoiding annoyance to consumers and also avoiding great fire risks.

Write for complete description of this and other water works specialties.

The A. P. SMITH
MFG. CO.
East Orange, N. J.

CUMMER PORTABLE ROAD ASPHALT PLANTS (3 UNITS)

750, 1250 and 1800 yards 2 in. sheet asphalt daily or other standard mixtures
EASY CAPACITY
CUMMER PLANTS NEVER WAIT FOR HOT SAND
THE F. D. CUMMER & SON CO.
CLEVELAND, OHIO

OVER 200 IN OPERATION
New York Offices:
No. 19 West 44th Street

NATIONAL CAST IRON PIPE CO., BIRMINGHAM, ALA. WATER PIPE—GAS PIPE

PROMPT SHIPMENTS
SALES OFFICES:
(Write Nearest Office for Prices)

NATIONAL CAST IRON PIPE CO., Peoples Gas Building, Chicago
NATIONAL CAST IRON PIPE CO., Commerce Trust Bldg., Kansas City, Mo.

NATIONAL Pipe is made Right-on new equipment—by use of special cores.
NATIONAL Pipe has smoothest inside finish—easiest to work.

Send for complete information about The Blackburn-Smith

SEWAGE EJECTOR SYSTEM

The Blackburn-Smith Corporation, 109 Park Ave., New York

DIRECTORY OF CONSULTING ENGINEERS

Engaged in Municipal and Public Work

ALVORD, JOHN W.**BURDICK, CHAS. B.**

Consulting Engineers

Reports, Investigations, Plans and Specifications for Water Supplies, Water Purification, Water Power, Sewerage, Sewage Disposal

Hartford Building, Chicago

THE AMERICAN APPRAISAL CO.

Milwaukee New York

Authoritative Reports and Valuations Covering Public Utility, Municipal, Mineral, Industrial, Commercial and Residence Properties.

BLACK & VEATCH

Consulting Engineers

Inter-State Bldg., Kansas City, Mo.

Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations, Reports.

E. B. Black.

N. T. Veatch, Jr.

BROSSMAN, CHAS.

Consulting Engineer

Merchants' Bank Building, Indianapolis, Ind. Water Supply, Sewerage and Disposal. Lighting Plants—Supervision of Construction and Operation. Appraisals—Expert Testimony.

BURNS & McDONNELL

Consulting Engineers

Appraisals	Expert Testimony
Sewerage	Rate Investigations
Water Works	Lighting
Clinton S. Burns	R. E. McDonnell
Kansas City	Inter-State Bldg.

CAIRD, JAMES M.

Assoc. Am. Soc. C. E.
Chemist and Bacteriologist

Office and Laboratory:

92 Fourth St., Troy, N. Y.

Water Analysis and Tests of Filter Plants

COLLINS, JOHN L.

Consulting Civil & Sanitary Engineer

Water Supply and PURIFICATION
SEWERAGE and SEWAGE DISPOSAL
Plans, Estimates and
Supervision of Construction

30 Church Street, New York City

DOW & SMITH

Chemical Engineers

Consulting Paving Engineers
A. W. Dow, Ph.B. F. P. Smith, Ph.B.
Mem. Am. Inst. Ch. Engrs.
Mem. Am. Soc. Civ. Engrs.
Asphalt, Bitumens, Paving, Hydraulic
Cement, Engineering Materials
131-3 East 23d Street, New York

New York City 2 Rector Street

A. E. HANSEN

Hydraulic and Sanitary Engineer

Design and Supervision of Construction
Sewerage Water Works
Sewage Disposal Water Purification
Drainage Water Works Valuation
Garbage Disposal Water Analysis

HAZEN, WHIPPLE & FULLER

Consulting Hydraulic and Sanitary Engineers, Water Supply, Sewerage, Drainage, Valuations, Supervision of Construction and Operation.

ALLEN HAZEN G. C. WHIPPLE
W. E. FULLER L. N. BABBITT
C. M. EVERETT H. MALCOLM PIRNIE
30 East 42d Street, New York City

HILL AND FERGUSON

Consulting Engineers

Water Supply Sewage Disposal
Hydraulic Developments
Reports, Investigation, Valuations, Rates,
Design, Construction, Operation, Management,
Chemical and Biological
Laboratories

112 E. 19th Street New York City

R. HUSSELMAN

Consulting Engineer

Design and Construction of Power Stations
and Lighting Systems

Reports, Estimates and Specifications
Appraisals and Rate Investigations
Electric, Gas and Street Railway

CUYAHOGA BUILDING, CLEVELAND, O.

J. L. JACOBS & CO.

Industrial and Municipal Engineers
Investigations—Reports—Plans
Covering
Organization, Management, Accounting and
Cost Methods. Employment and Wage
Problems — Appraisals — Expert Testimony

Monadnock Building, Chicago

POTTER, ALEXANDER

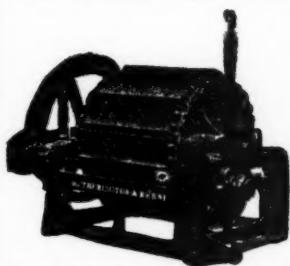
50 Church Street, New York City

Civil and Sanitary Engineer

Specialties:
Water Supply, Sewerage and Pavements

The H & B Paving Brick Testing Machine

N. P. B. M. Standard Rattler



For the Testing of Paving Brick

As we now build this machine it embodies all of the Latest Improvements

and refinements of construction that have been found desirable during a period of try-out covering almost one year of time and conducted under the direction of the technical committee of the National Paving Brick Manufacturers' Association.

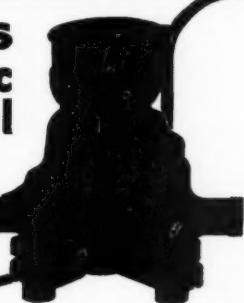
For descriptive circular and prices address

HEETHERINGTON & BERNER
INDIANAPOLIS, Ind.

PITTSBURGH METER COMPANY

Water Meters
for all Domestic
and Industrial
Services

East Pittsburgh, Pa.
New York
Chicago - Kansas City
Los Angeles - Seattle
Columbia, S.C.



A PITOMETER SURVEY
will find all the underground service leaks,
fixture leaks, closet leaks and the unnecessary waste of water.
Pays for itself many times over.

Write for particulars

The Pitometer Company
50 Church St. New York



CAST-IRON DIDE

descriptions for Water, Gas, Sewerage, Drains, Conveniences, Etc. Also Flanged Pipe, Flexible Joint Pipe, Special Castings, Large Cylinders and Heavy Castings. Quality and Service Guaranteed. Let us quote on your next requirements.

United States Cast Iron Pipe & Fdry Co. BUREAU OF NEW YORK

SLUICE GATES
Shear, Flap and Butterfly Valves

FLEXIBLE JOINTS

COLDWELL-WILCOX CO.
NEWBURGH, N. Y.

Box 574

DECARIE INCINERATORS
FOR MUNICIPALITIES AND INSTITUTIONS
—ECONOMICAL AND SANITARY—
STACY-BATES COMPANY
MCKNIGHT BLDG SELLING AGENTS MINNEAPOLIS
WRITE FOR LITERATURE

The Geiger Line

Drain and Stop Valves, Special Swing Gate Valves, Overflow and Relief Valves, Special Sluice Gates, Skimming Screens, Tide Gates.

These specialties have been installed all over Europe and are giving thorough satisfaction.

Apparatus, machinery and equipment for Water Filtration, Sewage Treatment, Garbage Reduction, Rubbish Destruction.

Ask for new bulletin describing these specialties

The Sanitation Corporation

165 Broadway New York City

APPROVAL

HERSEY DETECTOR METER

The Hersey Detector Meter has been accepted for thirteen years in 3, 4, 6, 8, 10 and 12 sizes without any restrictions or conditions of any kind by every Insurance Company, Stock and Mutual, doing business in the United States, and by the Water Departments and Water Companies in more than 600 Cities and Towns for use on over 4,000 Fire Services protecting over \$200,000,000 worth of Insured Property.

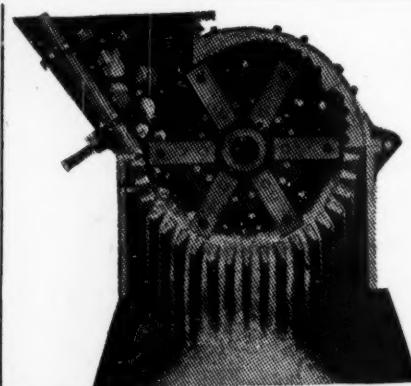
HERSEY MANUFACTURING COMPANY
BOSTON NEW YORK CHICAGO COLUMBUS, O.
PHILADELPHIA ATLANTA SAN FRANCISCO

INDEX TO ADVERTISEMENTS

A	Page E	Page K	Page R	Page
Acme Road Machinery Co. 23	East Ohio Sewer Pipe Co. 28	Kinney Mfg. Co. 23	Ransome Conc. Machy. Co. —	
Alvord & Burdick 30	Electro Bleaching Gas Co. 26	Koehring Co. —	Republic Creosoting Co. —	
American Appraisal Co. 30	Elgin Sales Corp. —	Koppel Industrial Car & Equipment Co. 23	Root Spring Scraper Co. 32	
American Bridge Co. 4	Emerson Pump & Valve Co. —	Standard Paint Co. —	Ruberoid Co. (formerly the Standard Paint Co.) —	
American-La France Fire Engine Co. 27	Erie Mach. Shops. 6			
American Tel. & Tel. Co. —	Etnyre & Co., E. D. 6			
Austin-Western Road Machinery Co. 7				
B	F	L	S	
Badger Meter Mfg. Co. —	Flory Mfg. Co., S. —	Landreth, C. P. 32	Sanitation Corporation 31	
Baker Mfg. Co. —	Ford Meter Box Co. 25	Layne & Bowler Co. —	Smith, A. P. Mfg. Co. The 29	
Barrett Co. The —		Leschen & Sons Rope Co. A. 23	Smith & Sons Mfg. Co. —	
Bissell Company, F. —		Loper Fire Alarm Co. —	Stacy-Bates Co. 31	
Blackburn - Smith Corp. The 29			Standard Oil Co. (N. Y.) —	
Black & Veatch 30			Standard Paint Co. (now the Ruberoid Co.) —	
Blaw-Knox Co. 30			Standard Scale & Sup. Co. 5	
Brossman, Chas. 30			Standard Steel Works 8	
Brown Holsting Machy. Co. 2			Sterling Eng. Co. —	
Burch Plow Works —			Sternier Co., E. J. —	
Burns & McDonnel 30			Stewart, W. H. —	
Buffalo Springfield Roller Co. 25			Stock and Road Machy. Co. —	
C	G	M	T	
Caird, James M. 30	Galion Iron Works & Mfg. Co. —	Mandt Body Co. —	Texas Co. 34	
Clark, H. W. Co. —	Good Roads Mach. Co., Inc. The —	Marine Metal & Supply Co. 26	Thew Shovel Co. —	
Coldwell-Wilcox Co. 31	Granite Paving Block Association of U. S. Inc. —	McNeil & Bros. Co., Jas. —	Thomson Meter Co. 29	
Collins, J. L. 30	Gruendler Patent Crusher & Pulverizer Co. 32	Mueller Mfg. Co. —	Tiffin Wagon Co. —	
Cook, A. D. —		Muncie Oil Engine Co. —	Truscon Steel Co. 3	
Cummer & Son Co., F. D. 29				
D	H	N	U	
Dee, Wm. E. Co. —	Hansen, A. E. 30	Nat'l Cast Iron Pipe Co. 29	Union Water Meter Co. 32	
Delaware Clay Products Co., The 25	Hayward Co. —	Nat'l Moulding Press Corp. —	U. S. Cast Iron Pipe & Fdy. Co. 31	
Dixon Crucible Co., Joseph —	Hazen, Whipple & Fuller. 30	Nat'l Steel Fabric Co. —	Universal Road Machy. Co. —	
Dow & Smith 30	Headley Good Roads Co. 6	Nat'l Water Main Cleaning Co. —		
Duff Mfg. Co. The —	Heil Company 23	Newport Culvert Co. —		
Du Pont de Nemours Co., E. I. 33	Heitzel Steel Form & Iron Co. 4	New York Continental Jewel Fi tration Co. 26		
	Hetherington & Berner. 6, 31	Norwood Engineering Co. 25		
	Hersey Mfg. Co. 31	Nye Odorless Crematory Co. —		
	Hill & Ferguson 30			
	Holt Mfg. Co., Inc. —			
	Husselman, R. 30			
	Judy Manufacturing Co. 7			
I	J	O	W	
Ingram-Richardson Manufacturing Co. 27	Jacobs & Co., J. L. 30	Orton & Steinbrenner Co. 6	Warren Bros. Co. 21	
P	Jaeger Mach. Co. 6	Oshkosh Mfg. Co. —	Warren Fdy. & Mach. Co. 29	
Pacific Northwest Press Clipping Bureau —	Jennings Automatic Dump Body, Inc. —	Owensboro Ditcher and Grader Co. 5	Ward Plow Co. 21	
Pawling & Harnischfeger Co. —	Judy Manufacturing Co. 7		Willite Rd. Const. Co. 6	
Penn Salt Mfg. Co. —			Wyckoff Pipe & Creo. Co. Inc. 6	
Pioneer Asphalt Co. 21			Wyckoff & Son Co. A. —	
Pitometer Co. 31			Z	
Pittsburgh Meter Co. 19, 31			Zelnicker, W. A. 26	
Portland Cement Assn. —				
Potter, Alexander 30				
Providence Body Co. —				

UNION

WATER
METER
COMPANY
INC. 1868
Worcester Mass.
Send for Catalog 49



GRUENDLER PATENT CRUSHER & PULVERIZER CO.
DEPT. P.

We Manufacture
a complete line
of Crushing
Plants, Gravel
Washing and
Screening Plants.
Write for further
details.

Direct Oxidation Process

APPARATUS FOR CARRYING OUT THIS PROCESS
FOR SEWAGE AND WATER TREATMENT SUPPLIED UPON ENGINEERS' SPECIFICATIONS.

C. P. LANDRETH
15TH and LEHIGH AVE. PHILADELPHIA, PA.

They Are Making Good



ROAD MAINTAINERS

Save \$30.00 Per Day
Do 50 Per Cent Better Work
ROOT SPRING SCRAPER CO.
Kalamazoo, Mich.

WHEN YOU WRITE ADVERTISERS YOU WILL
DO THEM AND US A FAVOR BY MENTIONING

PUBLIC WORKS



*View of Eastern Laboratory of
Repauno Plant, Gibbstown, N. J.
One of the five great laboratory
groups maintained by the Du Pont
Company.*

What the Laboratory Brings to the User of Explosives

THE tremendous strides made in the development of newer and more efficient types of explosives during the past fifty years are traceable, very largely, to experimental work done in the five great laboratories maintained by the Du Pont Company.

There, working with minutest care over test tube and retort, or at the ballistic testing apparatus, or in the field making practical tests, are over 300 chemical engineers—men who are devoting their lives to devising safer, more efficient and more economical explosives to be the servants of the great productive and constructive industries of the world.

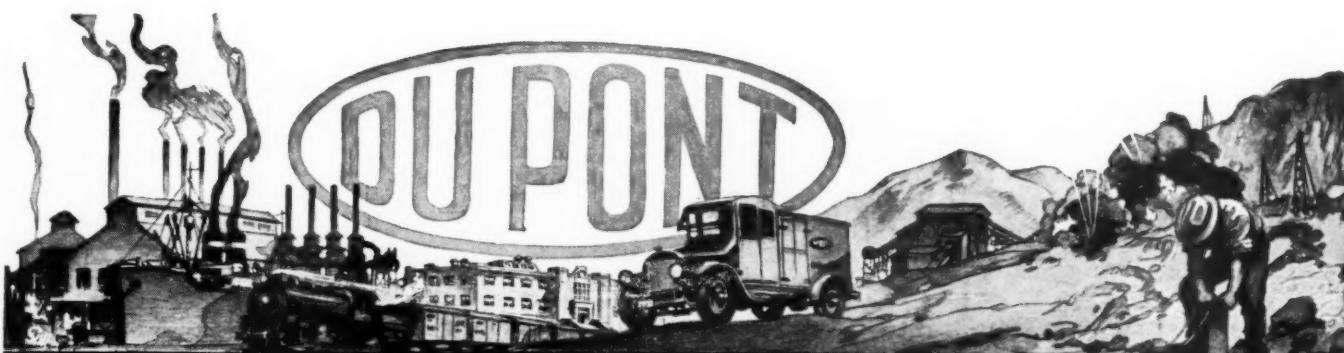
These facilities for experimental work certainly form an important part of Du Pont Explosives Service. Our vast production, so accurately supervised to insure uniform Du Pont quality; our nation-wide, highly-organized system of distribution, and practical service *at the work* by experts whenever desired compose a very remarkable service—which is yours to command.

Users of explosives have *confidence* in Du Pont Explosives and Du Pont Service—and justly so.

E. I. du Pont de Nemours & Co., Inc.

Sales Department, Explosives Division

Wilmington, Delaware



EXPLOSIVES ~ SERVICE

PUBLIC WORKS

KANSAS CITY



TEXACO Asphalt Macadam on Linwood Boulevard, Kansas City, Missouri. This pavement was laid in 1913. Photo taken 1920.

World-fame has rested its mantle on Kansas City, that thriving, pulsating center of Western business activity. This fame has come through the marvelous Park and Boulevard system of which Kansas City proudly may boast.

For sheer splendor and natural scenic beauty the Park System of Kansas City is unsurpassed. And this system is matched in excellence by the 90 miles of improved boulevards which lead to and wind through the parks.

A
N
D



TEXACO Asphalt Macadam on Ward Parkway, Kansas City, Missouri. Pavement laid in 1916 and photograph taken in 1920.

To accomplish this great system of Parks and Boulevards, careful and expert planning was necessary. Likewise, materials of the highest quality were demanded for construction that would harmonize with the surroundings.

We point with pride to the fact that TEXACO Asphalt has played and is playing a large and important part in the construction of many thousand square yards of the roadways in Kansas City and its parks.

TEXACO



The Texas Company

Asphalt Sales Dept., 17 Battery Pl., New York City



New York
Philadelphia

Richmond
Boston

Jacksonville
Tampa

New Orleans
Memphis

Chicago
Cleveland

Oklahoma City
Kansas City

Houston
Des Moines

Minneapolis
Wichita

